MEDICAL NURSING

The R^t Hon^ble

W. E. Gladstone

with the Editors' compliments.

MEDICAL NURSING

NOTES OF LECTURES GIVEN TO THE PROBATIONERS AT THE LONDON HOSPITAL

BY THE LATE

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WITH AN INTRODUCTORY BIOGRAPHICAL NOTICE

BY

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PREFACE.

In accordance with the wishes of many of the late Dr. Anderson's friends, I have edited the Notes of his Lectures on Medical Nursing delivered to the Probationers of the London Hospital. For this purpose Dr. Anderson's family placed in my hands his own notes, and as, in some cases, these were very brief, they have been supplemented by other notes, taken down at the time of delivery by those who had the privilege of hearing the course. The first lecture was written out by Dr. Anderson himself, and appears in its original form, whilst the others have required some amplification.

My best thanks are due to Lady Clark and the Royal College of Physicians for their kindness in allowing the portion of the late Sir Andrew Clark's last Presidential Address referring to the late Dr. Anderson to be reprinted.

E. F. L.

52 St. John's Wood Road, N.W.

September, 1894.

CONTENTS.

LECTURE VIII.

LECTURE IX.

LECTURE X.

LECTURE XI.

LECTURE XII.

LECTURE XIII.

LECTURE XIV.

LECTURE XV.

BIOGRAPHICAL NOTICE

OF THE LATE

DR. JAMES ANDERSON

BY SIR ANDREW CLARK, BART.

From the last Presidential Address delivered by the late Sir Andrew Clark at the Royal College of Physicians, London.

On the 28th of February, 1893, Dr. James Anderson died. Only three days before he appeared to be in the fulness of health and vigour, and his death, totally unexpected and tragically sudden, has thrown a cloud of grief over many of his contemporaries.

He was born in year 1853 in the parish of Logie-Buchan, Aberdeenshire. He received his education at the Gordon Hospital School in Aberdeen, and his student days were spent at the University of that city. There he passed through a highly distinguished career in Arts, and when the M.A. degree was conferred upon him he took a gold medal and the Murray Scholarship. In his medical curriculum he was equally successful. His name almost invariably stood first in the records of class examinations and in 1877 he graduated as M.B. and C.M. "with the highest honours." He was then appointed Demonstrator of Anatomy at the University

of Aberdeen and this post he held for two years. Thereafter he went abroad to Berlin and Vienna where he devoted himself to the study of clinical work, especially in the departments of Laryngology and Ophthalmology.

In 1880 Dr. Anderson returned to this country and soon afterwards he was appointed Demonstrator of Anatomy at the London Hospital, where he has since held the offices of Medical Registrar, Assistant-Physician, and Lecturer on Pathology. He was also Senior Assistant Physician at the National Hospital for the Paralysed and Epileptic, and for some years he was Assistant-Physician at the City of London Hospital for Diseases of the Chest. Dr. Anderson acted as Examiner in Physiology and Natural History at the University of Aberdeen, and he was also a Member of the Examining Board of the Royal Colleges of Physicians and Surgeons. He was elected a Fellow of the Royal College of Physicians in 1887, and he was likewise a Fellow of this Society and of many of the other Medical and Scientific Societies in London. Dr. Anderson acted as joint editor of the "Ophthalmic Review," and he contributed many articles on nervous diseases to the Medical Journals.

Dr. Anderson was a man of exceptional character, ability, and promise. As a teacher he was popular and successful from his under-graduate days in

Aberdeen, when circumstances made teaching a necessity, till later years when it became one of his chief delights. As a physician his thoroughness, his calm judgment, his special skill in nervous diseases, and his wide knowledge of general Medicine were earning for him a well deserved reputation. He had passed through the seed time and the summer, and had reached the harvest which he was never to reap. Dr. Anderson was widely cultured and possessed a highly artistic taste.

He was pure minded, upright, self-sacrificing, and independent. A trustworthy and a steadfast friend, he was beloved by all who had the privilege to know him. Recently Dr. Anderson suffered a severe bereavement in the death of his mother. She had been early left a widow, and between her and her son there was a bond of sympathy and love altogether exceptional in its closeness and in its strength. She was ever first in his thoughts; and her approbation was the stimulus that urged him on to that work which begot his success. Since her death he had never been quite the same man. Still he seemed in good health up till the evening of February 26th, when he was suddenly attacked by severe diarrhœa and hæmorrhage, followed by syncope. Next morning he was found by his servants in a state of collapse. Some of his medical friends were hastily sent for, and during the day which followed

everything that their care and love could suggest was done for him. But all was done for him in vain; and his life full of work, of uprightness, of loving kindness, and of the highest promise, was thus brought to an untimely end.

MEDICAL NURSING.

LECTURE I.

INTRODUCTORY.

I AM asked to give the concluding course of lectures, that is a series on Elementary Physiology and Medical Nursing. Hence I take it for granted that my audience has heard the two previous sets of lectures on "Nursing" and on "Elementary Anatomy and Surgical Nursing." This both lessens and increases my responsibility. It lessens it because other teachers share my responsibility. It increases it because I am last, and have therefore to address a more critical audience. I shall not, however, attempt any formal finish or *ex cathedrâ* dignity in my lectures, but hope that they will rather pertain to a pleasant conversation as between friends.

In my syllabus I have been bold enough to announce that in the first lecture I would define the medical nurse, and also give some reasons why she should know some elementary physiology. Medical nursing differs from surgical in certain points and to many will probably appear less interesting. In the third year of their curriculum most medical

students are fully determined to be surgeons, and I imagine that some amongst you nurses, who have had only a little experience, are of much the same mind. So soon as the first qualm of the heart at the sight of blood is over there is a positive charm in surgery. "It is so satisfactory," my pupils tell me, "there is something for you to do and something actually done in surgery. This is so different from medicine." And it is so. When a man is carried into the operating theatre with two legs, and is brought out with only one, there can be no doubt that something has been done. The man is rid of his disease, which has literally been lopped off. Again, in a case of hernia, the surgeon cures it completely with the aid of the knife. The patient is in great pain, his life even is endangered. The surgeon removes the trouble and pain completely, and restores the patient to health and active life. This is a fine thing, no doubt, and the surgeon gets honour as does the soldier. But again, a patient comes into hospital with nothing externally wrong. He has, perhaps, only some difficulty in breathing, or perhaps, only a severe headache, and you are told that he has heart disease or brain disease. He lies there in bed from day to day, perhaps from week to week, and slowly, perhaps very slowly, he gets better, or on the other hand perhaps he gets worse, steadily going down hill, and you watch from day to day the death shadow deepening on his face. It is hard to believe that in such cases you are really doing very much to *actively* relieve disease. This wish to step in and right the wrong straightway is very natural

to all, and I honour the great surgeon as I do the great soldier. It *is* a fine thing to see the calm surgeon arranging his instruments, conscious that he is master of the situation. Then follows the skin incision, a few arteries are tied or twisted. One or two more cuts follow, his finger is on the band that is doing the harm, it is cut, the rupture is returned, and the wound closed. Thus certain death has been arrested. I honour, too, the surgical nurse, who is to the surgeon a second pair of eyes, a second pair of hands, the calm, ready, steady woman that I know some of you already are.

But you are to be *medical nurses*, for the time being at least, and to be good medical nurses you will require to be good surgical nurses—and something more. The something more is not easily defined. It is a knowledge of and touch with humanity. The long-suffering patience which looks before and after, takes advantage of any change for the better, and carefully removes from the way all stumbling blocks that may oppose the *vis medicatrix naturæ*. A nurse cannot be *deus ex machinâ*. It is the unimpatient but alert attitude which comes with knowledge and observation, and it is this which constitutes medical nursing the very highest work that a woman can undertake, giving scope for all that is best in her of intellect and of feeling.

Your special duties as medical nurses will appear in subsequent lectures, but I may at the present time sum them up by saying that you are to be earnest, wise, and kindly helpers to your patients, loyal and intelligent co-workers with your physician.

Loyal and intelligent co-workers—let me finish that first. That is a fine word *loyal*. What a contrast to *legal*. The old Latin word *lex* from which the latter is derived, has been spiritualized in passing through the French *loi*, and thus *loyal* is to *legal* what the spirit is to the letter. I cannot tell you what it is to be loyal to your physician. If a man is not a gentleman you cannot make him one by laying down rules, and if a woman is not a lady the same applies. Good feeling and good sense, with a free application of the golden rule, will keep you right. No doubt difficulties will arise. When do they not arise? When your physician is both an able and an honourable man, it is easy to be loyal, but all physicians are not able, and *some* are not honourable. What then? If he is not honourable, say so to him, and be done with it. But first be sure of your ground, and be ready to prove it to the hilt if necessary, and secondly, say it gently and to him alone. But say it. Lend yourselves to no dishonesty.

If he is not able, do your best to carry through the case well, and do not come in contact with such a physician again. But, again, be very sure of your ground. See that it is not your ignorance which is at fault instead of your physician's want of ability. A little modesty and some careful study will keep you right here.

You will note that I have said an *intelligent* co-worker. I have no sympathy with the notion that a nurse has only got to do what she is bid, machine-fashion. You can never really do properly what you are bid machine-fashion. You must have a reason,

and it will be part of the object of these lectures to help you in this respect, but they can help you only if you give good honest work to it yourselves. And this work must be *earnest*. If you have no earnestness, no enthusiasm in your work, you will do no good. It is better to be earnest, even though in error, than to lack this quality and merely drift with the tide. For this reason I prefer Becky Sharpe to Amelia in Thackeray's "Vanity Fair," and confess to having rather a liking for bad boys and bad girls. I can well remember in my boyhood that I thought Jacob a sneak and Esau not a bad sort of fellow. But in the case of nursing it is no evil thing. Put your soul in it then.

For the patient, the medical nurse should have, first, an *observant eye;* secondly, *a ready hand;* and thirdly, *a kindly heart.* There are some women utterly unfitted for being nurses, and whom no teaching will ever make such. There are, first, women who are *blind;* secondly, women who have *no hands;* and thirdly, women who have *no heart.*

Blind.—The woman who is blind, that is who sees without perceiving, I do not know what she is fit for, certainly not for nursing. There is a story related of Houdin, the world-famed conjurer, that he used to practise to see how many of the books in a bookseller's window, he could note as he passed. He found that at first they were very few, but finally that he could note a great many. The cultivation of the faculty of observation is most important for a nurse, and may, if carefully trained become keener day by day. The observant eye is most necessary

in medical cases, which are often very intricate, and where it is not always very easy to see what is the matter. Hence a nurse should cultivate the "clinical instinct" which will enable her to see what is the matter with the patient almost at first sight, and to tell whether the patient is improving or getting worse. A nurse is constantly with the patient, and can therefore see that the change has occurred, or that there is something wrong, as for instance, the peculiar look in the face, which tells of a change coming, or the turning on one side in typhoid fever, which shows improvement. The nurse will also be able to note in her patient, the eye, the colour of the face, the furtive glance, the movement of limbs. She will also be able to detect malingerers, and in all these ways form an invaluable help to the physician by the general observations she is able to make. By practice, observation is made which will be stored up instinctively, though the method by which it is done cannot be imparted.

No hands.—The cook who can boil potatoes well and make good coffee can do anything. Similarly the nurse who can change the underlinen and bed-linen of a helpless patient can do anything. How quickly a patient recognises the hands around him! The gentle yet decided touch of the true woman gives him confidence, and he resigns himself to her. This is a most important point, that the patient should feel he can leave himself entirely in his nurse's hands, and that he should not need to think for himself; but if there is hesitation on the part of the nurse, even if it is kindly hesitation, the

patient begins to think and act for himself, and you have lost your position, and will not readily regain it.

No heart.—This is the most serious want of all in a nurse. Some nurses think it all a matter of business between the doctor and patient, and between the nurse and the patient. But it is nothing of the sort. A nurse must establish the personal relationship, or she has no right to help. She must not be in too great a hurry. Let it grow gradually, do not show too much, and do not pretend to it when it is not there. Remember that the "quality of mercy is not *strained*." Do not show too much feeling else you exact a recognition. Such a show of sympathy arises usually from what I should call a nurse's unpardonable sin, self-consciousness. A self-conscious nurse is simply a nuisance. If you have a sympathetic nature be thankful, it is one of the best gifts from Heaven, but keep your hand on the curb, and never lose your hold of the rein, and never expect a recognition of the sympathy you show.

If you have the misfortune to be in any way peculiar, whether in the way of good looks or the reverse, let your common sense enable you to put, and keep, this peculiarity in its proper place, and if you cannot do so, then give up nursing. There are other walks in life where self-conscious beauty is not so much out of place as in a sick-room or hospital-ward. I know I am now touching on delicate ground, but I do not think it is beyond my province. But if it comes up to you while at work, that you are a very kind, or charming, or a very plain, not to say ugly, person, then give up nursing.

A woman, however, with an observant eye, a hand ready to put itself to anything, and a kindly heart, with a fair physique, and having her emotions under good control, in fact, a sound mind in a sound body, should make a good nurse.

Some of you, no doubt, will go out to earn a livelihood as nurses, or perhaps to nurse the poor. In either case you will be false to duty if you feel in your own minds that you are doing a favour to those you nurse, and act accordingly. Many people have an objection to lady "nurses," and the question is, is it well grounded? I believe in many cases it is so. For myself, unless I knew a lady-nurse well, I would certainly give the preference to a sound, sensible woman who had no knowledge of her grandfather. Such a knowledge is good certainly, but unfortunately it more frequently than not, goes with a sense of doing a favour, and such a person needs a servant to attend to her, and to do half her work. No hard and fast duties can be laid down for the guidance of the private or district nurse. She must carefully remember that there are the difficulties of a household upset by illness to contend with, but a good and tactful nurse will get things into order as soon as possible and as quickly as possible. A gentle firmness, combined with tact, will put matters right.

Unfortunately the private nurse is often treated with great want of consideration as regards rest, meals, fresh air and exercise. It is only too common an occurrence for the family by which a nurse is employed to think that because she is only with

them a comparatively short time, she should devote her whole time to attending to her duties, both all day and a greater part of the night, quite forgetful that a nurse is but mortal and requires rest and sleep like other people, and that, unless she gets them, she not only suffers herself, but she cannot, even with the best will in the world, give her full powers to her patient. Thus it is necessary for the nurse to quietly but firmly insist on a proper amount of rest, and not to allow it to be cut short except under very exceptional and urgent circumstances. The same applies to meals. It is not true that "anything will do for nurse." She must insist on good wholesome food, in sufficient quantity and variety, but she must not expect luxuries, or be fanciful and fault-finding. She must bear in mind that a serious or long illness is a very great tax on persons with only moderate means. The private nurse must remember that she owes the very best she can give to her patient, and that by keeping herself in vigorous health and thoroughly "fit" she directly benefits herself and indirectly benefits her patient too.

Elementary physiology.—We must first consider what physiology is, and then why it is necessary that you, as nurses, should know something about the elements of it.

Physiology is sometimes called the "doctrine of life," or perhaps more concretely "the human body in action." You have already received instruction in elementary anatomy in the course of lectures on surgical nursing, that is, you have learnt something

about the structure of the body. I have now to tell you something of what these parts have to do, that is their function, in other words, I have to deal with the human body in action.

Why is it necessary that you, as nurses, should know something about elementary physiology? Why might you not learn a few practical rules during your period of training? Why need you have scientific principles impressed upon you? If life were a mere standing still, or even a beaten path, there would be no need of principles of action; but life is not so. There is constant change going on, there are new environments, and consequently the need for adaptation to new surroundings, if we are to be reasonably comfortable and to do good work. The plant is fixed in one place and its life is comparatively simple. Again, a sea anemone is fixed but has more varied powers than the plant, whilst the bird has absolutely free movement. Man is both movable and is constantly varying. If you were rooted like a tree, and all your cases alike, and all in a hospital, there would not be the same need for you to know some elementary physiology; but as it is you have to deal with constantly changing cases, and you also leave hospital, and are thrown on your own resources as private or district nurses. It is then that you will find the advantage of having principles to rely on as well as experience. Experience is all very well if it is exceedingly wide, but then it takes a great many years to accumulate enough, and if you had to deal with a case which had not come within your experience you might be at a loss how

to act. It is for this reason that you must build up your experience on a solid foundation of principle. Therefore, for example, I shall try and teach you something of the effects of stimulants and the principles which underlie their use. Ordinarily the physician will decide whether a stimulant should be given or not, but occasions will arise when the duty of decision rests with you. For instance, a patient has fainted from loss of blood. The question you have to decide is whether he is to have a stimulant or not. It will often be at least a question of life or death, and you cannot solve it without having some principles to go upon. Or a patient is bringing up blood and at last faints. A nurse with no knowledge of physiology would give stimulants to restore him to consciousness. But a nurse with a knowledge of elementary physiology would know at once that no stimulant should be given under such circumstances, as it would cause the heart to pump more blood, and thus the bleeding would continue. The fainting gives the blood a chance of clotting because it is flowing very slowly, and this is nature's way of stopping the bleeding.

Again, if a case come into the wards diagnosed "renal dropsy," a knowledge of elementary physiology would teach a nurse that the patient should at once be put to bed, and warmed with blankets and hot bottles and given a hot drink. The nurse would also know that in such a case the kidneys have probably had too much work thrown upon them, and therefore have ceased to act, and hence the skin and bowels, which are the complimentary organs to the

kidneys, have from some cause, cold, constipation, or otherwise, also ceased to do their part, and the warmth is applied and the hot drink given for the purpose of causing the skin to act and to do its part in throwing off the impurities of the blood.

Again, a knowledge of physiology would teach a nurse how extremely dangerous it is to give solid food to a patient suffering from typhoid fever. In all such cases, and many others which might be cited, a knowledge of physiology will both guide the nurse and will prevent her from making fatal mistakes, and will also make her a better and more intelligent co-worker with the physician. This knowledge will also enable her to act with intelligence in an emergency, and although these do not occur very frequently in a hospital, still they may, and they often do in private and district nursing. Hence if there is never any need to actually use such knowledge it is right that a nurse should have it. A soldier obeys orders, but he is a better soldier if he knows why the orders are given ; and it is exactly the same with a nurse.

LECTURE II.

Feeding the Patient.

Nurses should understand principles of foods and feeding—How a patient's food should be set before him—Foods and principles of diet—Classification of foods—Advantages of a mixed diet—Milk—Eggs.

The digestive system may be compared to the foundation of a house, it is the most important system in the body, just as the foundation of the house is the most important part of the building. The first essential in a human being, from our present point of view, is to be a good animal. The foundation should be underground, strong and well built, and with a good drainage system. It is extremely unfortunate when the foundation, that is the digestion, has to be frequently uncovered and examined. Such a person is most unhappy, and usually tolerably selfish, for although the digestion is of so much importance, it is not well that anyone should be too much troubled about it.

It is specially important for nurses to have clear principles on foods and feeding, and for two main reasons as follows :—

1. Because of the intrinsic importance of the matter.

2. Because it is often left to her.

Many medical men know little and care less about dietetics, and therefore it is specially incumbent on

the nurse to do her best. If definite rules are laid down as regards the hours at which food is to be given, also as to its nature and quantity, these must be conscientiously carried out. If no rules are given, use your own discretion, and arrange a dietary with what general help you can get from your physician.

The following points should be remembered in connection with feeding your patient :—

1. Do not ask your patient about what he will eat, but decide that matter for him, and unless he is very ill indeed, he will feel more interest in his meal from not knowing of what it will consist. Do not yield to unreasonable whims and fancies, but, at the same time, study your patient's peculiarities.

2. Let the food be well cooked, neither too much nor too little ; let it be punctually served, and in the best style, and in the best state, with scrupulous cleanliness, and all the appointments as nice as possible. Let the patient be quite ready beforehand to take his food, that is to say, comfortably propped up in bed, and properly protected from cold, with arms and chest carefully and suitably covered, so that he will neither be inconvenienced in eating his food, nor uncovered in the midst of his meal. The cloth on his tray must be faultlessly clean, his knife and fork bright, the lid of the mustard pot bright, &c. Also see that everything is at hand that he will require, and never let him wait. It is only discouraging to a patient to just begin his meal and then find that there is no salt or some equally indispensable article, and that the

nurse has to go and fetch it, and meanwhile the food becomes colder and the keen edge of appetite and pleasure in his food has gone. If milk is drunk, bring it in a glass and not in a cup or jug, and do not let the glass or anything else be filled so full that there is danger of spilling.

3. Do not place too large a quantity before your patient at once. It only suggests defeat, and to have to attack a solid mass of meat, for instance, is like storming a fortress. Remember that excellent proverb "hunger is the best sauce." Have more food in reserve rather than disgust him with a large quantity. Do not leave your patient alone during his meals; a nurse with tact can always find some little thing to do about the room, so as not to actually watch her patient, and few things are more distressing than to have someone sitting and watching you all the time you are eating. Also conversation is not a bad condiment, and should be encouraged as it is a good thing for digestion. The solitary feeder is generally dyspeptic because he is apt to bolt his food, so as to get through his dreary meal as quickly as possible. Sometimes the patient requires a little coaxing to begin his meal, and in this case give him a sip of the stimulant he is going to have with his food, to begin with. It is a good rule for a dyspeptic patient not to allow him more than a breakfast cup, or about half a pint of liquid with a meal, which should be drunk towards the end, with of course the exception of a sip at the beginning, which may always be given if he likes it. Most people are apt to drink far too much during

meals. A patient should not be allowed to drink before eating for the following reasons:—(1) Because it dilutes the gastric juice, and (2) because it interferes with the congestion, or filling, of the blood-vessels of the stomach, which is necessary to digestion. Hence let the liquid part of the meal be taken slowly and towards the end. Patients suffering from heart or lung trouble do best on a very dry diet.

4. Patients have a tendency to bolt their food, especially when fed. Hence if a patient has good teeth, and is able to masticate his food, he should be encouraged to do so. If his teeth are not good he should have pulpy food at all his meals. But where it is necessary to feed him, the nurse must be very careful not to show any signs of impatience or inclination to hurry him, but should try and entertain him. He will also be less likely to bolt his food if he be set up comfortably in bed before beginning.

5. When the meal is over, clear away at once. Straighten the bed so as to remove all rucks, and see that there are no crumbs on the under sheet, as these are a most fruitful source of bedsores. Have a sponge and towel at hand for the mouth and hands, and cool and freshen with lavender water or eau de Cologne.

6. The nurse has often to decide how frequently food should be given, but no hard and fast rule can be laid down on this point. This must be decided according to the nature of the disease, and each patient must be a law to himself. As a rule patients are fed too frequently. The gastric juice takes a

little while to re-accumulate after each digestive process, and if food is given very often the stomach gets no rest. When express orders are given a nurse can only carry them out conscientiously, but when it is left to her own judgment, four meals a day is the ordinary number. But if nourishment is to be given oftener, it should not be more than every two, or, perhaps, three hours, for milk or solid food, unless for instance when a patient has been losing much blood. Of course stimulants may be given in between the meals.

Do not try to cram a dying patient with food, as it worries him and renders his last moments more painful than they would otherwise be. A dying man will swallow any liquid that is given him, but he cannot digest it, and thus it merely remains in the stomach in an undigested form, and causes discomfort. Therefore do not try to feed a dying person.

Foods and principles of diet.—The body is a very complex machine, under definite laws—quite as definite indeed as those which govern the action of a steam engine. As a steam engine may become choked with too much coal, or accumulation of ashes, so the body may be choked with too much food or accumulation of effete matter, if the waste products are not duly cleared away. The body, however, differs from a steam engine which cannot repair itself, because it will do so for a certain time, although it ultimately wears itself out. Thus certain sorts of food are required to repair tissues and also to produce the force needed to move the body. The

income and the expenditure are exactly equal. In one form or another a certain amount of food passes into the body, and a certain amount of energy passes out, just as in a steam engine, a certain amount of coal is burnt up and in return a given quantity of work is done. It is very important not to overfeed the body and overtax it. Thus in kidney disease a large amount of meat is most injurious. Like a smoky chimney when only enough coal must be added to keep in the fire, so with the kidneys, as little meat should be given as possible, for they are not able to deal with a large quantity, and the patient gets convulsions or disease of the heart and arteries. The body, if intelligently fed, has a self-reparatory power.

The old division of foods was into "heat-producing" or "force-producing," and "tissue-forming" foods or those which replace the wear and tear of tissues. They are, however, better divided into classes, as follows:—

1. *Proteids*, or nitrogenous or albuminous foods, which contain carbon, hydrogen, oxygen, nitrogen, with sometimes a very little sulphur or phosphorus for the nervous system. Under this heading come:—

(*a*) Albumen of egg and of blood.
(*b*) Myosin of muscle or flesh.
(*c*) Gluten of flour.
(*d*) Fibrin of blood.
(*e*) Casein of milk.
(*f*) Gelatin and chondrin, which are extracted from cartilage by long boiling.

2. The *Non-nitrogenous foods*, which include:—

(*a*) Fats or hydro-carbons, which consist of carbon and hydrogen with a little oxygen, and include all substances such as butter, fat of meat, and various oils contained in vegetables and other substances.

(*b*) Carbo-hydrates, which consist of amyloids or starchy foods, and saccharine or sugary foods, all these contain the three elements, carbon, hydrogen and oxygen.

(*c*) Minerals or inorganic substances, which include water, salts, iron for the blood, and oxygen.

(*d*) Condiments, which, however, are not a very considerable group.

The amount of oxygen (or gaseous food) taken in daily by the lungs should be about 10,000 grains, equal to $1\frac{1}{2}$ lbs., and that taken into the body in the form of dry solids amounts to about 8000 grains and equals $1\frac{1}{4}$ lbs.

The proportion of nitrogenous to non-nitrogenous foods is as 1 to $3\frac{1}{2}$ or 4, thus nitrogenous matter is essential only in small proportions, whilst the foods classed under the head of non-nitrogenous are chiefly force and heat producers. Starches and sugars are very closely allied, since they contain exactly the same elements but in different proportions. But for purposes of nutrition fat is twice as valuable as starch.

Proteids are the most important foods, as they contain all the ingredients that are required for building up the tissue of the body, namely:—carbon, hydrogen, nitrogen, oxygen, sulphur and phosphorus.

Nitrogen is not found in any of the other groups classed as non-nitrogenous.

The proportions of each group which the body requires for its complete nutriment are:—

1st Group or Nitrogenous foods	$4\frac{1}{2}$ oz.
2nd Group or Fats	3 ,,
3rd Group or Carbo-hydrates	$14\frac{1}{2}$,,
4th Group or Mineral or inorganic matter	1 ,,
	23 oz.

This makes 23 oz. in all of dry food. As all foods, however, contain some water, usually nearly half their weight, we get about 46 oz.; and this, together with about the 50 oz. of actual fluid which we drink during the day, make up nearly 100 oz. The above proportions form a very good diet for an average man in ordinary work; for a man in hard work, the total of solids and liquids may even amount to 300 oz.; whilst for a person who does not do much work, and who is at rest, the amount should be less, perhaps 16 oz. of solids, making with fluids a total of 92 oz. Of course these quantities must vary under different circumstances, and for different people, but the above numbers give a fair average diet.

The question is, why should we not live on meat alone?

An average sized man throws off in one day by the lungs, skin, bowels and kidneys, 4000 grains of carbon, and 300 grains of nitrogen, and hence to keep the income and expenditure equal the same

amounts of carbon and nitrogen must be taken into the body every day. But to obtain these amounts from meat alone we should have to eat 4 lbs. of fatless meat to give us 4000 grains of carbon, whilst 1 lb. of fatless meat would be sufficient to give us the necessary 300 grains of nitrogen. Hence to obtain the proper amount of carbon from meat alone we should have to take four times more nitrogen than we want, and this large surplus would have to be thrown off by the kidneys, and would greatly overtax them.

Or if we tried to live on potatoes only, we should have to eat 20 lbs. to get 300 grains of nitrogen, whilst 4 lbs. would yield the necessary 4000 grains of carbon, and hence if we depended on potatoes alone for nitrogen, we should greatly overdo the carbon. Therefore the best and most economical plan would be to have a mixed diet, and combine meat and potatoes, the meat to supply the nitrogenous and the potatoes the non-nitrogenous foods in proper proportions. Such food, together with water, would enable a man to live, though it would be much better with the addition of fat, which is preferable to starch as a carbon supply.

Some people believe in a vegetarian diet, and certainly in some cases, especially when a person has been in the habit of eating a great deal of meat, such a diet does seem to answer very well. The drawback to it is that a much larger bulk of food has to be eaten to satisfy hunger than is the case when meat forms part of the meal. Many people, however, keep quite well on this diet. Moreover,

our teeth prove most conclusively that we are intended to be carnivorous animals, and should be omnivorous feeders. Milk is an ideal food, and is therefore a diet on which we can theoretically live to an unlimited extent. In practice, however, an average man would have to drink so much milk—at least nine pints in the day—that this would be an inconvenient diet. The constituents in 100 parts of milk are as follows:—

Water	89
Casein	4
Butter	$2\frac{1}{2}$
Sugar	$4\frac{1}{4}$
Salts	$\frac{1}{4}$

Eggs again form an almost ideal food. The white of egg is albumen, which is an almost pure proteid; whilst the yolk contains some fat. Thus in 100 parts of white of egg we find the following proportions of the constituents:—

Water	78
Fat	*none*
Nitrogenous substances . . .	20·4
Salts	1·6

Whilst in the yolk of egg the proportions are somewhat different, as seen in the following table:—

Water	52
Fat	30·7
Nitrogenous substances	16
Salts	1·3

Now let us consider the practical conclusions to be drawn from all this.

In the first place what is the result of eating too much food?

The first consequence is that the outlets get blocked up; then follows indigestion and perhaps vomiting. If persisted in, in spite of these warnings, there follows acute or chronic dyspepsia. If these first warnings given by nature are neglected, then at last she claims the penalty, which is a heavy one. The next common result is excessive corpulence. The fat is all deposited on the surface of the body instead of being used up by combustion. With corpulence, less exercise can be taken, and a bigger body means that more food is required. Thus a vicious circle is established, and finally one of the excretory organs, usually the kidneys, fails. Hereditary corpulence, however, is unavoidable.

Next, what is the result of taking too much starch and sugar?

The proteids are spared and fat is deposited. This is more common in Germany and some other foreign countries than with us. The consequence is that people become flabby instead of having firm healthy flesh.

Lastly; what is the result of eating too much meat?

It is the same as taking in too much proteid food, and is the English besetting sin. It throws extra work on the kidneys, causing kidney or heart disease, or gout. In gout the kidneys become diseased owing to the extra work thrown on them. Gout is much more common in England than in Scotland, where very much less meat is eaten.

A nurse is often rather puzzled to know whether beef tea or milk is the better diet for a patient, when the choice lies almost exclusively between these two forms of food. Until lately the preference was given to beef tea, but opinions have changed, and it is now found that milk has incomparably greater nutritive power, and that beef tea is more of the nature of a stimulant, and contains comparatively little nourishing, that is flesh-forming, material. Hence milk should be the chief constituent of an invalid's diet, varied occasionally by a little beef tea.

LECTURE III.

Digestion.

The various systems found in the body—The Tongue—The Teeth—Course of the Food—Constipation—Piles.

The body contains a certain number of systems, such as :—

1. The nervous system, which is the most important of all. It is separated from the others and placed alone in the skull and spinal cord.

2. The circulatory system, which comprises the heart and great blood vessels to the head and upper part of the body.

3. The respiratory system, which includes the lungs, bronchi, and wind-pipe. These last two are contained in the thorax or chest.

4. The digestive system, which is placed in the abdomen, comprises the mouth, which contains the lips and teeth, the œsophagus, stomach, small and large intestines, as well as such organs as the liver and pancreas.

In the course of digestion the food has a great deal of change to undergo and a long passage to make before it is transformed into the various tissues of the body. Food is put into the mouth, thence it goes by the gullet into the stomach, then through first the small and then the large intestine, which together are from 24 to 26 feet in length, and finally the surplus, which has not been absorbed on

the way, passes through the rectum and leaves the body by the anus.

Let us see what happens to the food during this long journey. The lips and cheeks have first their part to play in the process of digestion, as they help in mastication and in preparing the food so that it may be swallowed. The lips take hold of the food and help to land it in the mouth. The tongue also helps in the same way. Its upper surface is covered over with papillæ. At the back of the tongue these papillæ are large; about the middle there are smaller ones arranged in a V shape, and towards the tip and in the front there are still smaller papillæ. Those at the back and in the front are specially concerned with taste, and make us conscious of the kind of food in the mouth, whether sweet or sour, pleasant or disagreeable: the papillæ in the centre of the tongue have to do with the sense of touch, which is very acute.

We can learn much about the state of a patient's health from the appearance of the tongue. Thus the absence of papillæ shows that the digestion is bad, and gives rise to the expression a "bare" or "bald" tongue. A "furred" tongue is white and creamy looking and tells of a bad appetite; or if furred on one side only, of the presence of tender teeth, (or of their absence altogether), which causes the patient to bite only on one side.

A dry, hard tongue is generally found where there is fever.

A bare, beefy tongue occurs in diabetic patients.

The teeth play a very important part in the diges-

tion of food, and are very essential to health. Some people, it is true, get on well without any, but these are certainly the exception. They may get on for a few years, but later on they are sure to have some signs of indigestion, such as pain after food, flatulent distension of the stomach, or constipation.

The first teeth are twenty in number and are called the "temporary" or "milk teeth." They consist of 4 incisors or cutting teeth; 2 canine or eye teeth; and 4 molars or grinding teeth in each jaw.

The first teeth appear in children about the end of the sixth month, the incisors come first, then the four anterior molars, the canines, and lastly the four posterior molars. They finish coming about the end of the second year. As a general rule the teeth appear first in the lower jaw, but this is by no means an invariable rule. The milk teeth appear in the order and at the ages given as follows:—

The first to appear are the middle incisors at about the seventh month; the second to appear are the lateral incisors at about the ninth month; the third to appear are the anterior molars at about the twelfth month; the fourth to appear are the canines at about the eighteenth month; the fifth to appear are the posterior molars at about the twenty-fourth month.

The temporary teeth should be very carefully looked after and even stopped if necessary. The canine teeth should not be removed early, or else the jaw will contract, and there will be no room for the new ones to come, and when they do, they will get

pushed out of place forming what are called "buck teeth," which give a very ugly appearance.

The teeth in children are the great guide as to the way in which they should be fed. A child should be suckled, if possible, for six months, or, rather, so long as it has no teeth. If the teeth come sooner, the time may be shortened, or prolonged if the reverse. If suckling is impossible, then the child should be fed on milk, but on no account must food with starch in it be given, because it cannot be digested until the teeth appear. If the child be given food with starch, (such as arrowroot, cornflour, potatoes, bread, &c.), it may become fatter for a time, and appear to thrive on it, but after a little while, a catarrh of the stomach will be produced, and gradually the child will waste away.

The temporary or milk teeth are replaced by the permanent, or second set of teeth, which begin to appear about the sixth year. The permanent teeth are 32 in number: 4 incisors; 2 canines; 4 bicuspids; and 6 molars in each jaw. The first to appear is the one behind the first temporary molar, about the sixth year, and it is generally the first to decay, and they continue to come from the ages of six to fourteen with the exception of four known as the "wisdom teeth," which do not appear till between the ages of 10 and 24. These sometimes cause extreme pain, people complaining often of a shooting beginning in the ear and going down the neck into the shoulders during the time they are coming. The ages at which the various permanent teeth appear are as follows:—

The first permanent molar appears about the sixth year; then the middle incisors drop out and are replaced about the seventh year; the lateral incisors drop out and are replaced about the eighth year; the first bicuspid displaces a temporary molar about the ninth year; the second bicuspid displaces a temporary molar about the tenth year; the canine teeth are developed about the eleventh year; the second true permanent molar appears between the twelfth and twelfth and a half years; lastly the wisdom teeth appear between the eighteenth and twenty-fourth years.

All acid medicines, especially tincture of perchloride of iron, are very injurious to the teeth, and should be taken through a glass tube, and the mouth rinsed out thoroughly afterwards with warm water.

Whilst the food is being bruised and broken up by the teeth, it becomes intimately mixed with the saliva and this process is called "insalivation." The use of the tongue is not chiefly for speech, because we can speak very well without it, but to move the food about in the mouth and bring it within reach of the teeth, and to turn it over so as to mix it more thoroughly with the saliva. In front of the ear and below the tongue at the back of the jaw are the salivary glands, which secrete about two pints of saliva in the day. The uses of the saliva are twofold.

1. It moistens the food.

2. It changes starch into a form of sugar called "grape-sugar," owing to the presence in the saliva of a ferment called "Ptyalin." This ferment is not

found in the saliva until after the teeth begin to erupt and that is why young children must not be given starchy food as they cannot digest it, and it causes irritation in the stomach and intestines just as any other indigestible mass of food. The causes which make the saliva flow are :—

1. The mental stimulus, that is, the thought of food.

2. The reflex stimulus, that is, the smell or taste of food.

3. The mechanical stimulus, that is, the movements of the jaw which compress the glands, and cause the saliva to flow.

The combined actions of the lips, the teeth and the tongue compose the process known as "mastication."

When the food has been thoroughly broken up and mixed with saliva, the next process is "deglution," or swallowing. The nasal cavity and the mouth are connected with a large muscular bag called the pharynx, which is the upper part of the gullet, or œsophagus.

The food being on the tongue, is raised by it and carried backwards, and after it passes beyond the tongue it is out of our control. As it has to pass over an aperture into the larynx or wind-pipe which communicates with the lungs, to prevent its falling into the wind-pipe, or "going the wrong way" and causing choking, the muscles of the wind-pipe contract, and a small flap, called the "epiglottis," which is placed there, is carried backwards and covers this opening. Thus the food is safely carried into the

pharynx, whose muscles contract and carry it down into the gullet and so into the stomach. The return of food through the nose is prevented by another flap of muscle which is pulled upwards against the back of the throat and nose during the act of swallowing, and closes the cavity. In diphtheritic paralysis, this flap hangs down loose, and therefore the food returns through the nose.

The food does not fall down the gullet as it would down a rigid tube, but is propelled along by a wave-like movement called "peristaltic" movement. The gullet is an elastic tube which contracts behind the bolus of food and expands in front of it and in that way it is squeezed onwards. If the gullet were a rigid tube down which the food and liquid merely dropped by its own weight, we should not be able to swallow food standing on our heads, or lying down, but only when we were in an upright position. Whereas it is quite possible to swallow when standing on our heads, a feat frequently done by acrobats and others.

If the stomach is in a healthy condition, as soon as the first morsel of food enters, its walls become very red owing to the increase of blood in its vessels, and the secretion of the gastric juice takes place. If the stomach is unhealthy, its coats remain pale and there is pain and discomfort. The gastric juice is most important in digestion, and every day from ten to twenty pints are secreted. Its chief constituent is pepsin, which is a ferment, and hydrochloric acid, but it is the pepsin which is the active digestive agent in the stomach, and the use of the gastric juice is to

change the proteids or albumens into peptones. So long as the proteids remain such, they are of no use, for they cannot be absorbed until they become peptones.

The stomach is a muscular bag connected with the gullet at the upper end, and with the small intestine at the other, from which it is closed off by a valve called the pylorus. The shape and size of the stomach varies a good deal in different people. Its coats are formed of muscular fibres arranged in different directions, which arrangement enables it to contract and churn about the food and turn it over and over, so that it may become thoroughly mixed with gastric juice. The internal coat of the stomach is richly supplied with blood vessels and with glands which secrete and pour forth on the food the gastric juice.

The churning process to which the food is subjected in the stomach and its admixture with gastric juice, convert it into a thick pultaceous fluid about two hours after it has been taken in, and this is called "*chyme*." About the same time the food passes along the narrow part of the stomach on the right side, the valve, called the pylorus, guarding its entrance is opened whether the food is digested or not. If undigested it will cause pain, headache and distension. If the food we eat is of an unsuitable kind and irritates the stomach, then vomiting occurs.

The part of the digestive system which the food enters on leaving the stomach by the pylorus, is the small intestine. This is a tube about 20 feet in length and is divided up into three parts, called

duodenum which is 8 to 10 inches long, then the jejunum, which comprises two-fifths of the remainder, and the ileum, comprising three-fifths. The walls of the small intestine are muscular, like those of the stomach; and by their "peristaltic" or worm-like action, alternately contracting above and expanding below the mass of food, it is carried along the whole length. At the junction of the small and large intestines is a valve called the ileo-cæcal valve, the use of which is to prevent the food, after it has passed into the large, from being forced backwards again into the small intestine. In the upper part of the small intestine the food becomes mixed with two important digestive juices, which are secreted by two glands. These are:—

1. The bile, which is secreted by the liver, and is stored up in the gall-bladder ready to be poured out on to the food as required.

2. The pancreatic juice, which is secreted by the pancreas or sweet-bread.

The large intestine is also divided into three parts, the cæcum, which is shaped like a pouch, short and wide, and is placed on the other side of the ileo-cæcal valve and is thus continuous with the small intestine; the middle part of the large intestine is called the colon, and this again is divided into three parts, called according to their positions, the ascending, transverse and descending colon.

The ascending colon goes straight up the right side, then across under the stomach, forming the transverse part, and then the descending part goes down the left side. Here it makes a twist called

the sigmoid flexure, and then passes into the pelvis where the lowest part of the large intestine is called the "rectum." On the wall of the cæcum is the vermiform appendage, a short closed prolongation, the use of which is not known, though it is often a source of great danger when food or fæcal matter becomes imbedded in it and sets up peritonitis. As the food has been advancing along the intestines the liquid part has been gradually absorbed; but when it passes through the ileo-cæcal valve it is still fluid and by this time has acquired a fæcal odour. During its passage through the large intestine much of the liquid part is absorbed and by the time it reaches the descending colon it is quite solid. It is because the food has acquired the special fæcal odour which is characteristic of it, that when there is obstruction in the bowels we may have such a thing as "fæcal vomiting," which is a very dangerous symptom.

Defæcation depends upon the perfection of the muscles of the intestines. The bowels should be moved every day, otherwise the waste food will collect in the large intestine, and be absorbed by the system and poison it. Moreover the large network of veins which are round the lower end of the intestine ready to carry the blood back, cannot do their duty if the blood is stagnant, but become congested and hæmorrhoids or piles are the result. In constipation the fæces gather in the lower part of the bowels and are not expelled because the muscular parts of the walls of the intestines are weak. The habit of emptying the bowel at regular times can be acquired, and it is very essential to health that it should be acquired, but nevertheless under some

circumstances purgatives and enemata are required, though they should always be regarded as evils, even if necessary evils sometimes.

Piles very often accompany chronic constipation, and appear as a protrusion of a piece of the mucous membrane of the lower intestine. They are caused by the loaded bowel pressing on certain blood-vessels causing them to become swollen and enlarged, in fact "varicose." The bowels should be kept loose and the piles well anointed with the ointment prescribed for their relief by the medical man in attendance. On no account should the first appearance of piles be neglected, for it is a trouble that is sure to increase, though it can be greatly relieved if taken in time. If allowed to increase to any extent, they are extremely painful, cause a great deal of trouble, have a tendency to bleed, and a surgical operation has to be undergone for their removal. If taken in time they are usually very amenable to simple remedies, and need cause very little trouble. Sometimes the bleeding from piles is great and then it is serious as it weakens the patient and increases the risk of his taking some other disease, such as phthisis. Piles cause a sense of weight and depression of spirits.

If attention to diet, and eating fruit, vegetables, &c., is not sufficient to secure a regular motion of the bowels, then laxatives, such as confection of senna or liquorice powder, must be resorted to. Regularity, however, in giving the bowels a chance at a fixed time, is of more importance than is generally acknowledged, and many persons would avoid constipation by attention to this simple rule.

LECTURE IV.

Digestion and Absorption.

Functions of the Bile and Pancreatic juice—The Lymphatics and absorption—Feeding of Children—Nutrient Enemata.

Digestion is a process of fermentation. A ferment is a body which is capable of producing change in some other body without changing itself. Thus each of the three chief digestive fluids produces some change in the food which comes in contact with it, but is not itself changed.

Continuing the course of the food through the body, after it has been partially changed by the digestive ferment of the stomach or gastric juice, it is next acted upon in the small intestine by the bile from the liver. This is a bitter, yellow, alkaline juice, which deals with the fats of the foods, and with them produces:—

1. Emulsification, or the breaking up of the fat into very minute particles.

2. Saponification, or the formation of soap by breaking up the fat into its original constituents, viz., glycerine and a fatty acid, and mixing the latter with an alkali.

When the food has been thus acted on it appears as a milky fluid. About two pints of bile are excreted in the 24 hours.

The third and last digestive juice or ferment with which the food is mixed is the pancreatic juice, excreted by the pancreas or sweet-bread. This deals with all sorts of food, and finishes up the work of all the other juices. It is, as it were, the "odd boy," who as a rule does most of the other servants' work, so that any food left undigested from the mouth or stomach will not now escape.

All these changes have rendered the food ready to be absorbed; thus the sugar is the absorbable form into which all starch has been changed; peptone is the absorbable form into which all albuminous or nitrogenous foods have been changed; and soapy emulsions the absorbable form of all fats. Proteids, as such, cannot pass through an animal membrane like the walls of the intestine, but in the form of peptone they can do so. Food contained in the intestines is still outside the body, and is useless; it only becomes part of us after it has been absorbed and has got into the blood, which is done by the small intestine, and in two ways, thus:—

1. By the blood-vessels in the walls, which absorb peptones and sugar.

2. By the lymphatics, which absorb fats.

Absorption is greatest in the small intestine, and little is absorbed in the large intestine, though perhaps a very little may be. Fluids, such as water, milk, &c., are, to a great extent, absorbed in the stomach.

The lymphatic or white blood system is one of the most important in the body. Lining the intestines you will find a substance resembling the pile of

velvet, composed of innumerable little bodies forming points, and called villi. Each villus is a minute tube, up the centre of which runs a finger-like projection, closed at one end, and filled with a milk-like fluid called "chyle," which is chiefly the product of the emulsified fats. These are called "lacteals," and they unite into larger tubes, until at last they end in the thoracic duct, which is a vessel about as thick as a pencil case. It ascends by the back of the abdomen, in front of the spine, passes through the thorax, and finally opens into one of the large veins at the root of the neck, on the left side, called the subclavian vein, and in this way the changed food gets into the regular blood stream, and to the heart. In the lymphatics at intervals are enlargements called lymphatic glands, and in them the lymph is formed into white corpuscles.

In the case of poisoned wounds the poison will get into the lymphatics, and so into the blood, and a very serious state of things will result.

The liver is a very important organ, and is situated at the upper and right side of the abdomen, and weighs from three to four pounds. It is larger in a child relatively to its size than in an adult. The common idea is that the sole use of the liver is to secrete bile, and that when this function is disturbed a person is bilious. Its functions are more important than this, however, and are threefold, namely:—

1. It secretes from the blood a bitter, greenish-yellow fluid called bile, which is a natural purgative and disinfectant.

2. It acts on and splits up the peptones brought

to it, and during this process of decomposition urea is formed.

3. It acts as a storehouse of sugar and starch foods, which are transformed into glycogen. This is not allowed to pass all at once into our blood-vessels, but is stored up in the liver, and given out slowly as required. Otherwise, if it were all given out at once we should suffer alternately from a feast and a famine. But the liver acts like the fly-wheel to a machine, and only allows a little to be given off at a time. Sometimes, however, it is given off irregularly, or in large quantities, and is allowed to pass into the blood, when it has to be thrown off by the kidneys. Then follows a condition called diabetes, which is a disease characterized by large quantities of sugar circulating in the blood, and having to be got rid of by the kidneys. There are various forms of diabetes. If the disease comes on at an early age, say about 25 for instance, it very often causes death, but in later years it is comparatively unimportant. The great point is to give a diet which contains neither sugar itself, nor starch, which as we have seen is transformed into sugar. Diabetic patients pass a large quantity of urine as a rule, which contains a large quantity of sugar, whereas it should contain none. Patients suffering from diabetes are put on what is called "diabetic diet," that is, starch and sugar are excluded. There is no thoroughly satisfactory substitute for bread gluten. Pounded almonds and bran are used, the first most largely, and saccharine is substituted for sugar, but the patient always has a great longing for bread.

Potatoes are very largely composed of starch, and therefore any patient who has ever had sugar in his urine ought never again to touch either potatoes or sugar. Most green vegetables may be taken with impunity, but white vegetables, such as cauliflower, do contain a little starch, and no carrots, turnips, peas or beans may be eaten. No nurse should ever give a diabetic diet on her own responsibility, but should wait until the condition is settled beyond a doubt. A hospital diabetic diet consists of 6 oz. gluten bread, 6 oz. meat, gluten bread pudding, and watercresses.

Test for sugar.—Starch after it has been boiled (which breaks up the little starch granules and liberates the starch) when boiled with some Fehling's solution in a test-tube over a spirit lamp, does not alter in colour, because the starch has not been converted into sugar; but when the starch has been acted on by the saliva, and is then boiled with some Fehling's solution, it will give first a yellow and then a brick-red precipitate.

Test for albumen.—When boiled, albumen will coagulate like white of egg, or form a cloudy thickness, more or less, according to the amount of albumen. This also occurs when a little nitric acid is added to the solution containing albumen.

The liver has the power of secreting from the blood brought to it the fluid called bile; it also abstracts from the blood brought to it the substance called glycogen, which it can store up in its cells. The bile is carried to the gall bladder, where it is stored ready for use, and is poured therefrom on to the food in the small intestines as required.

Under some conditions, as when a patient has a very high temperature, no solid food can be digested, and then an exclusively liquid or fever diet has to be resorted to, and in some diseases, such as typhoid fever, must be most rigidly adhered to. The foundation of fever diet is beef-tea and milk, though any liquid is allowable, so long as it is entirely fluid, and does not contain any solid particles.

Beef-tea is at best but poor stuff, and at worst is simply hot water with a smell or taste of meat in it. It is really only a good stimulant, and contains very little, if any, nourishment when made in the ordinary way. By boiling you extract the salts from the meat, but coagulate the albumen, which is the really nutritious part. The following method, recommended by Weir Mitchell, is the only way in which beef-tea can be prepared for sick people to be of any use; cut the beef into slices, and pour some cold water, about one pint to a pound of meat, over it, and four drops of hydrochloric acid to each pint of water. Let it stand for some hours in a warm place, and shake occasionally. Next day it may be just warmed to a comfortable heat when required for the patient. This is called "raw meat soup." It is very nourishing, but many patients do not like it because it looks red, like blood, and has a very raw taste. The latter objection can be removed by putting the meat on a gridiron over the fire so as just to brown it on the outside before cutting it up. Such soup will not keep good for long and consequently must be made fresh as it is required.

Milk is an ideal diet, containing as it does all that

is necessary to sustain life, and in the exact proportions. When undiluted, it does not suit everyone; but when mixed with ordinary water, or barley water, or lime water (an ounce to every half pint is generally a suitable proportion) or if soda-water be added, it can generally be taken by everyone. The use of the lime or soda-water is to break up the curd which forms when the milk comes in contact with the hydrochloric acid in the stomach, and make it less solid, and more easily digested. For a patient it is generally advisable to give it with the chill off. Milk that has been boiled is much safer, though not so easily digested; some people also dislike the taste of boiled milk. In cases of disease attended by vomiting, very small quantities should be given at a time, and frequently.

Feeding of children.—Infants should be fed by their mothers alone for the first six months; the teeth are a sure indication when the food may be changed, and until they appear the saliva has no ptyalin to digest starchy substances. If for any reason a child cannot be fed by its mother, cow's milk is a good substitute, but it differs from human milk in two particulars, as follows:—

1. The casein of cow's milk is much coarser, closer and harder, and is on that account less easily digested.

2. The solid material is greater than in human milk, in the proportion of about 14 per cent. cow's to about 10 per cent. human.

To correct this, dilute the milk with something which will prevent its curdling in the stomach.

Lime water or barley water will do this. Cow's milk for infants should be diluted with an equal quantity of water, and have a teaspoonful of cream and a pinch or two of sugar added to it. For a very feverish child it is hardly possible to dilute the cow's milk too much. At first, milk and water in equal proportions may be given to an infant, then the proportion of milk should be increased until it is two-thirds of the whole; the milk, however, is still very poor, and therefore it is best to add a little cream, about a teaspoonful, and a small quantity of sugar.

An infant needs about one pint of milk at birth, and the quantity gradually increased, until at 9 months old it is taking 3 pints in the 24 hours.

An infant grows very rapidly indeed, so it should be fed every 2 hours at first during the day-time, that is, between 10 and 6, not so often in the night, say once or twice. Two bottles should always be in use at once, so that one can be soaking in water to which a little carbonate of soda has been added, so as to ensure absolute cleanliness.

A child should be weaned at nine months old, as it is then able to take other food, and requires something besides milk. Moreover the mother's milk alters in character, and is not sufficient to nourish the child properly. Prolonged lactation makes a child weak and liable to disease, such as rickets. No starchy foods should be given before the child is nine months old, and even then with care, and beginning with small quantities. If variety is required, there are plenty of artificial or patent foods prepared which have no starch.

When a patient has been on fever diet for some time, the question is, what kind of food can he take next? The digestion is often very delicate, without being actually diseased, and the return to solid food must be very gradual. What is wanted is food that will break up easily in the stomach, and will be readily acted on by the gastric juice. Fish, which must be thoroughly fresh and good; or white meats, such as chicken, which may with advantage be either finely minced, or pounded into a *purée* and mixed with potato and rice, which makes an excellent dish. Meat must be given with great caution after fever, especially red meat. Beef has a curiously strong effect in some cases, and may determine an attack of kidney affection in scarlet fever, or cause uræmic convulsions in acute kidney disease, or even cause a relapse in typhoid fever or acute rheumatism. Starch is an article of food not easily digested, althought it is popularly a favourite in illness. The digestion of starch, when in the form of a semi-fluid, as for instance arrowroot, which cannot be chewed and hence escapes the action of the saliva, is delayed until it comes in contact with the pancreatic juice in the small intestine, since the gastric juice, as we have already seen, has no effect on it, though it digests the milk, supposing the arrowroot to be made with milk. Hence the digestion of starch is greatly delayed, and might in some cases cause discomfort for that very reason, and as potatoes consist so largely of starch, they are specially to be dreaded.

Hydro-carbon diet.—The object of this is to allow as little proteid material as possible, and as much

starchy and oleaginous food. This diet is suitable for kidney disease and phthisis; it consists of bread, fat bacon, puddings, such as arrowroot or other starchy substances made with milk, as well as plenty of milk to drink. This gives the maximum of starch and fat and the minimum of nitrogenous food. It is given for the following reasons:—

1. To spare diseased organs, especially the kidneys.

2. For certain positive properties which this diet contains.

3. With the object of fattening, especially in wasting diseases, like phthisis.

When a patient cannot be fed in the ordinary way by mouth, recourse has to be had to nutrient enemata, and to feeding by the rectum. This method has to be adopted when there is difficulty in swallowing food, or in retaining it, and in such diseases as stricture of the œsophagus, gastric cancer, gastric ulcer, and also in some forms of hysteria. In some cases, notably in gastric ulcer, the object of nutrient enemata is to give rest to the stomach.

The first point to be attended to is to get the rectum free from fæces, and to do this a "simple" or purgative enema should be given. This generally consists of soap and water, in the proportions of one pint of water at 98° F. to two ounces of soap. Patients differ much in the amount they can bear, but it varies from one to two pints. Some are so nervous that they complain after only an ounce or two has been injected, which is of course useless, and the nurse must try to hit the happy medium.

Such an enema is best administered by a long tube or a Higginson's syringe. When it is advisable to inject the enema high up into the rectum, a large soft (Hutchinson's) catheter may be securely attached to the end of the syringe and introduced 6 or 7 inches, very cautiously and gently, and without using any force. The whole of the part introduced must be thoroughly smeared with carbolic oil or vaseline. A purgative enema should be administered steadily but not too slowly. Afterwards in due time the nutrient enema may be administered. This generally consists of peptonized beef-tea or milk, with egg cream or brandy added. The maximum amount given at one time should be four ounces, but the nurse should note the quantity that is most readily retained.

To peptonize beef-tea and milk, see Appendix.

If beef-tea is used it is best to strain it through very fine muslin, so as to get rid of the fine particles of meat which float about in it, and which cannot be absorbed by the intestines, and may cause irritation and sometimes diarrhœa. Nutrient enemata may often be continued for days or even weeks, but not as a rule for months, because the bowel becomes irritable.

Nutrient enemata are best administered by means of a good sized soft (Hutchinson's) catheter, with a glass funnel attached. The end of the catheter, after thoroughly oiling, is carefully inserted; it should be left a few seconds in place and the tube lowered, to favour the escape of any air or gas in the rectum which would hinder the entrance of the fluid,

and then the nurse should proceed to pour the nutritive fluid, small quantities at a time, into the glass funnel. The more slowly a nutrient enema is given the better. Sometimes it is a little while before the fluid will enter, and some management is required, as for instance alternately raising and lowering the tube, care being taken not to remove the end inserted; but it only requires patience, and a nurse must never be in a hurry when she has to administer a nutrient enema. Care must be taken not to chill the patient during the process. Sometimes a glass syringe may be used with advantage, either with or without a piece of tubing or a catheter attached. On no account should a nurse use the old-fashioned ball syringe to administer a nutrient enema. It is very difficult to keep clean, and there is always a certain amount of force used when an enema is administered by this means.

The catheter after use can readily have a stream of hot water run through it till it comes out clear, and should be kept in clean cold water till wanted again. On no account must the hard gutta percha catheters be used.

Sometimes a starch and opium enema is ordered to stop obstinate diarrhœa. The starch must be prepared in the ordinary way by stirring with boiling water, the required amount should be then measured out, about two ounces, and to this half a drachm of tincture of opium or laudanum must be added; this is equal to about two grains of opium. The starch must be allowed to cool, and when about lukewarm should be administered by means of a glass syringe.

When administered by mouth, only one grain or fifteen minims of opium may be given, but when given by rectum two grains or thirty minims is the usual dose.

Sometimes nutritive suppositories are employed instead of, or alternately with, a nutrient enema. The suppository must be well oiled, also the first finger, and must be introduced into the rectum and pushed up as far as possible. Sometimes a gutta percha catheter, well oiled, may be used so as to push it somewhat higher.

LECTURE V.

The Blood and Circulation.

Description of the Blood—Coagulation—Description of the Heart—The course of the Circulation of the Blood—The Blood-vessels—The Pulse.

The nutrient fluids we have been discussing are poured into the blood either through the thoracic duct or the liver. By these two chief ways the blood is the great carrier of the body. It also takes up waste products and conveys them to the organs which throw off the effete matters from our bodies, viz.:—the "excretory organs." Both pure and impure blood are thus circulating at the same time. Blood varies in colour from a bright scarlet to a dark purple. It is not a simple fluid, for if human blood be examined under a microscope of fairly good power, we notice little solid bodies $\frac{1}{3200}$ of an inch in diameter, apparently of a reddish colour, though really yellow when not seen crowded together in a mass, and called "corpuscles." These solid bodies are of two kinds. One kind are almost round, with the centre depressed, forming a bi-concave disc. The centre appears dark under the microscope, but this is merely due to light and shade. In a few minutes they aggregate and arrange themselves in a

peculiar manner like rows of coins placed one upon another. The red colour of the blood is due to the enormous number of these reddish yellow corpuscles collected together in masses. These are called the "red corpuscles." The other kind is distinguished as "white corpuscles." They are larger than the red, and fewer in number. Their diameter is $\frac{1}{2800}$ of an inch. If the blood is still warm, they are not quite round, and if watched under the microscope they alter very much in shape, sending out projections in various directions, and being capable of what is known as "amœboid movements." They have a peculiar granular appearance, and are said to have the power of taking up certain noxious products from the system and various particles in the blood on which they feed. The proportion of white corpuscles is about 1 to every 300 red, after food, and about 1 to every 800 red corpuscles after fasting. The white corpuscles are produced in the lymphatic glands, many of which are situated in the abdomen. Both the red and the white corpuscles float in a fluid called "liquor sanguinis." When liquor sanguinis is exposed to the air certain changes take place in it, and it becomes split up into two substances—"fibrin" and "serum." Fibrin has the power of forming blood-clot, and serum is a thin pale yellowish fluid which will not clot.

When blood has been drawn it presently clots, which means that certain things combine to form a solid. In a short time we see fine strings stretching across—this is best shown in a large quantity of blood—this network is the fibrin; it

contracts and entangles the corpuscles, which gradually sink to the bottom; and at the same time serum, which will not clot, is exuded. The blood then appears like a jelly, that is, "clotting" or "coagulation" has taken place, the clot floating freely in the serum.

The process of coagulation does not take place in the vessels during health, as a rule, but when it does, it is because the vessel is roughened inside, the fibrin being deposited on the roughened surface. Under some circumstances a blood clot forms within the vessels or heart cavities and is forced along until it comes to some narrow spot where it blocks up the vessel and so prevents the proper flow of blood. This condition is called "embolism." The liquor sanguinis or fluid part is very important because it contains the greater part of the nourishment of the blood, as it consists largely of albumen. The red corpuscles contain a colouring matter called "hæmoglobin" which is the portion of the blood that plays the most important part in respiration. This substance hæmoglobin has a great affinity for oxygen. It seizes on this gas which is present in the lungs and carries it to the tissues, which in their turn seize upon it. It consists of carbon, hydrogen, oxygen, nitrogen, sulphur and iron. Want of this iron in the hæmoglobin renders girls pale and breathless, and they are then called anæmic. The hæmoglobin is the great oxygen carrier of the body.

The blood also contains gases, such as oxygen, carbonic acid and nitrogen in varying proportions, according as the blood is arterial or venous. The

amount of blood is about $\frac{1}{13}$ of the whole weight of the body.

Arterial blood is a bright red colour, and is found chiefly in the arteries, it contains very little carbon but a large amount of oxygen.

Venous blood is a dark purple colour, and is generally found in the veins. It contains much carbon and very little oxygen. The nitrogen is about equal in both arterial and venous blood, but its function in connection with the blood is unknown as yet.

The circulation of the blood is carried on by:—

1. The heart.
2. The arteries.
3. The capillaries.
4. The veins.

The heart is a hollow conical-shaped bag, about the size of the clenched fist; it is situated in the middle of the body, lying in the centre of the cavity of the thorax, between the lungs, and behind the breast-bone. The broader part or "base" is inclined upwards and to the right side, and the narrower part or "apex" is inclined downwards, forwards, and to the left side. The chest and abdomen are separated by a thin muscle called the "diaphragm" or "midriff," and upon this rests a bag of membranous tissue, called the pericardium, in which the heart is enclosed. Thus the heart has the liver on the right and the stomach on the left, and is only divided from them by the midriff. Hence anything wrong with the stomach will, we can easily see, affect the heart and force it upwards, and this is one of the causes of palpitation. It is the very

worst thing possible to give a large amount of food to distend the stomach, especially if the heart cannot do its work properly under ordinary circumstances. The heart is composed of muscle, differing a little in microscopic appearance from that of the limbs. It has four cavities, two on each side; those on the right open into each other, as likewise do those on the left, but the two sides are perfectly distinct and separate, and do not inter-communicate. The cavities at the base of the heart are called auricles, those at the apex the ventricles and each cavity is capable of holding about five ounces of blood.

Between the right auricle and the right ventricle are valves called the "tricuspid valves," because they are composed of three flaps. Between the left auricle and ventricle are valves composed of two flaps only, and hence called "bicuspid valves," or sometimes "mitral valves" from their shape being supposed to resemble that of a bishop's mitre. The valves are formed of flaps of tough membrane, and hang down from the edges of the passages. The blood can easily pass in the right direction, but if it attempts to return, the flaps, owing to the backward pressure of the blood, close the passage. To prevent the flaps from going back too far, their corners are attached to the walls of the ventricles by a number of strong fine threads called the "chordæ tendineæ."

The pulmonary artery is also guarded by valves between it and the right ventricle, called "semilunar" valves. They are composed of three little pouches or pockets, shaped like half moons, the openings of which are turned towards the artery.

There are also other "semi-lunar" valves which close the aorta on the side of the left ventricle, and which serve the same purpose of preventing the blood from flowing backwards after it has entered the aorta.

The opening of the inferior vena cava into the right ventricle is guarded by valves called the "Eustachian valves."

It is often said that there are four circulations of the blood going on at once in the body. The principal one is called the "systemic," that which goes to the lungs is called the "pulmonary," that which goes to the liver is called the "portal," and that to the kidneys the "renal." In addition to these there is a special circulation which supplies blood to the substance of the heart for its nourishment—for although the heart propels so much blood through its chambers, none of it is actually absorbed by the heart—this is called the "coronary circulation." All these circulations, however, are subordinate to the main one called the "systemic," and it is this only which we will consider now.

To begin the circulation of the blood with that in the right auricle, which is filled with impure or venous blood, brought by two large veins coming respectively from the upper and lower parts of the body, and called the "superior" and "inferior" "venæ cavæ." When the auricle is full it contracts upon the blood and forces it through an opening into the right ventricle, which also contracts in its turn and forces the blood through a large vessel, called the pulmonary artery, into the blood-vessels

and capillaries distributed throughout the lungs. Here the blood undergoes certain changes, owing to the oxygen taken in by respiration and upon which the hæmoglobin has seized; then it is gathered up again by the four pulmonary veins, and poured into the left auricle; thence into the left ventricle which contracts and drives it with great force into the aorta, which is a very large vessel: by the aorta it is distributed to all parts of the body, the arteries getting smaller and smaller until they end in capillaries, and these forming veins which get larger and larger, and finally pour the blood into the venæ cavæ, by which it is brought back as venous blood to the right auricle of the heart, to begin the same process of purification and redistribution over again, and the circulation is complete.

As the heart is a muscular bag, it has the power of expanding and contracting, and as the blood must go somewhere, when one cavity is full and contracts, it goes into the next cavity, and is prevented from returning by the valves attached to the walls of the heart by the "chordæ tendinæ," which are just long enough to close the flaps or valves, but not long enough to allow them to open the other way. The cavities of the heart are of various sizes, and their walls of different thicknesses; those of the ventricles are thicker than those of the auricles, and the wall of the left ventricle is thicker than that of the right because it has three-quarters of the work to do; it has to force the blood into the aorta, which offers a certain amount of resistance, and thence to drive the blood a great distance, as it has to be propelled

throughout the whole body. The right ventricle has only to send blood through the lungs.

An "artery" means a vessel which carries blood *from* the heart, whilst a "vein" carries it *to* the heart. There is, however, one exception in the pulmonary artery, which carries impure blood from the heart to the lungs, but this is the one solitary instance of an artery carrying venous blood.

The arteries are thick fleshy tubes formed of muscular tissue, and very elastic. Although the amount of elasticity is less in the small arteries, the muscularity in these is great, and their internal walls are perfectly smooth in health. The largest artery in the body is the aorta, which issues directly from the heart, and receives the blood from the left ventricle. The arteries branch out into ever smaller arteries, and then into capillaries, and it is here that the chief work of the blood is done. These capillaries are very minute tubes with extremely thin walls, and the nutritive part of the blood and the white corpuscles can pass through them into the surrounding tissues. By this time the blood is changing colour and becoming venous; it has given out something and taken up something in exchange. The capillaries form the connecting link between the "arterioles" or minute arteries, and the "venioles" or minute veins. The blood now reaches these last and passing into ever larger veins, gets back to the right side of the heart. The veins are thinner than the arteries, they do not contain so much muscular fibre and are not very elastic. The two largest veins are about half the size of the aorta. In the

internal walls of the veins are small pockets like swallows' nests, arranged at regular intervals, their use is to prevent the blood from running backwards. So long as the blood flows in the right direction these valves lie flat and close to the walls of the veins, but if from any cause the blood flows in the wrong direction, it floats up these valves which fill up the vein and prevent the passage of the blood. These valves are easily seen on pressing a vein where it comes near the surface. If bleeding is taking place from a vein, do not press between the wound and the heart, but on the other side of it.

Blood travels at the rate of about one foot per second in the large veins, and about one inch per second in the capillaries and it takes about thirty seconds to complete the circulation.

There are two forces which cause the blood to circulate:—

1. The contraction of the muscles of the heart and its vessels.

2. The action of the skeletal muscles, which constantly compress the arteries and veins. Upon this fact depends the great benefit derived from massage, which replaces the action of the muscles by rubbing.

The blood is kept flowing and in the right direction by the valves of the heart, and also by those in the veins, as already seen. Those in the heart allow the blood to flow and then instantly close, so as to prevent it from flowing backwards again, and the peristaltic action of the arteries also forces it for-

wards. If there were no valves there would be a tendency for the muscular walls of the vessels to force it backwards.

The pulse is usually taken to mean the stroke of the blood in the radial artery: it is caused by the alternate expansion and contraction of the arteries, and may be felt by placing the fingers on any artery sufficiently near the surface, such as that in the wrist, neck or temple, though the radial artery at the wrist is usually selected as the most convenient. In taking the pulse, not only the number of beats per minute should be noted, but also the character of the pulse should be observed, whether easily compressed, so that it disappears, when it is called "soft"; whether small and weak; if soft and flickering it indicates danger, and generally shows a need for stimulants. A hard wiry pulse does not require stimulants. A pulse may be full, large and bounding, or small and wiry. A very firm or a very soft pulse indicates that the patient is not in good health. As a rule the beat of the pulse corresponds to the beat of the heart, but the rate varies very much in different persons and under various circumstances. In some it reaches 80 or 90 beats per minute, but the average is 60 or 70. Thus in a healthy adult the pulse beats may not exceed 40, though this would be decidedly slow; or they might reach 80 and good health be maintained, though this would certainly be a quick pulse. In young adults it averages 70, and 60 for an elderly person. It is quicker in children, and in an unborn child is about 150 per minute, or twice as rapid as the

mother's pulse. In old people we expect a slow pulse, though if in them it is as slow as 40 or 50 beats per minute we should regard it as a danger signal.

In syncope we find a soft flickering pulse; in inflammation of the abdomen a wiry one.

LECTURE VI.

Diseases of the Heart and their Nursing.

Various forms of Heart disease—Hæmorrhage from different causes—Fainting and its treatment—Nursing of heart cases in general—The action of Alcohol.

As we have already seen, the heart is enclosed in a conical bag having a smooth surface the inside of which is closely applied to the smooth outer surface of the heart, and thus the two surfaces glide smoothly on each other during a contraction without producing any sound. This bag is called the "pericardium;" it is a serous membrane, and in health there is a very minute quantity of fluid between the heart and pericardium, only just enough in fact to allow of perfectly smooth movement. The pericardium is liable to inflammation, when the surface becomes rough, and a large amount of lymph is thrown out from both the heart and the pericardium, and then a peculiar sound is heard with the stethescope, which is called "friction sound." Or the heart may become adherent to the inside of the pericardial sac, and this may be followed by enlargement of the heart and difficulty of breathing. Pericarditis is practically the only disease of the heart attended by pain, with the exception of angina pectoris.

As a rule, ninety-nine cases out of a hundred, when people complain of pain in the heart it is due to dyspepsia and not to heart disease. Pericarditis is often associated with acute rheumatism, or kidney disease, or acute pneumonia, or may sometimes though rarely be due to blows or cold. When patients are suffering from either rheumatism or pneumonia, care should be taken that the chest is not too much exposed during the doctor's examination of it, or too much percussed.

There may be "fatty degeneration of the heart," when the muscle or flesh of the heart itself is diseased, and the muscular walls become pale yellow. This form of disease generally attacks persons above the age of 50 or 60, and occurs most frequently in those who are thin and have a complexion of ivory pallor. The later forms of this disease are marked by repeated attacks of syncope, and the patient should be most carefully watched, and not allowed to hurry or exert himself in any way. Such patients are especially liable to die suddenly.

The lining membrane of the heart (or endocardium), especially that part of it which is thrown into folds and forms the valves, may become inflamed. This condition is called "endocarditis." This occurs in two classes of people:—

1. Young people, who suffer from an acute form of inflammation.

2. Older people who have worked or lived hard, or who have suffered from gout, often get chronic inflammation of the valves.

In 999 cases out of 1,000 it is the left side of the

heart which is diseased, that is, the valves which separate the left auricle from the left ventricle, and also the valve which guards the aorta. The exception to this rule is when a child is born with heart disease; then it is usually the right side which is affected. Thus we find the mitral and semi-lunar valves of the aorta are often diseased, but the tricuspid and pulmonary valves very seldom, and the reason for this is that the first named have the most work to do. The valves open and close 36,852,000 times in a lifetime of 70 years, and owing to this hard work they may get calcareous, or stretched, and then diseased, the flaps becoming incompetent to shut the orifice, and allowing the blood to get back. This is called "incompetence" or "regurgitation." Or instead of stretching they may become adherent and narrow the opening, and produce a state of things called "stenosis." The mitral valves ought to admit three fingers easily, the aortic valve two. There is a difference in the mode of death from mitral and aortic regurgitation respectively. In mitral regurgitation death comes slowly; in aortic regurgitation it generally comes suddenly, especially in active business men, who are often afflicted with it. When the mitral valves do not close properly there may be stagnation in the other part of the heart, the veins getting too full and the arteries too empty. This condition causes dropsy, the fluid getting through the walls of the veins into the tissues immediately under the skin. The lungs also get too full of blood, and this causes dyspnœa, and if the stagnation goes on, bronchitis may super-

vene. Then the liver becomes enlarged, and the digestion is upset; and the capillaries getting distended, the fluid of the blood passes through the walls, owing to the great pressure on it, with the result that œdema and dropsy are set up. Lastly the brain is affected, owing to the want of a proper supply of blood to it. In mitral disease sudden death is rare.

"Compensation" in heart disease means the thickening of the walls of the ventricles in order to meet the extra work thrown upon them by the regurgitation or obstruction.

Valvular disease of the heart is found most frequently in acute rheumatism, when the valves become thickened, at first from inflammation, and later either shrink away from each other so that they no longer meet and close the opening they ought to guard, or else become adherent and so narrow the opening.

The large arteries coming off from the heart are subject to a disease called "aneurism." This disease most often affects the aorta or main blood-vessel which carries away the blood from the left ventricle. The wall of this vessel becomes weakened, and owing to the pressure of the blood inside it bulges at this weak spot. A sac is formed which communicates with the artery and contains blood, and has been known to become almost as large as a child's head. As a rule, to begin with, there is pain and distress in the chest generally, but of a vague description; the walls of the sac are meanwhile becoming thinner and thinner, and finally may burst.

The rupture may take place externally through the chest wall, or internally into the pleural cavities, windpipe or gullet. Rupture of an aneurism, either external or internal, is usually speedily followed by death. The aneurism may press on some vital part, such as the trachea, gullet, or spinal cord, and so cause death without bursting.

The object to be aimed at in treating aneurism is to relieve it as far as possible by encouraging the deposit within it of fibrin, so as to close up the bag. To aid in the accomplishment of this, complete rest for a long time is sometimes rigorously enforced. In this case the patient must be absolutely confined to bed, and must not be allowed to get out on any excuse whatever, and must lie on his back. This is at first much resented by the patient, who is usually, apart from the aneurism, a strong, vigorous, active man, and hence great tact is needed by the nurse; and however trying her patient may be she must never lose her temper, especially in the case of this particular disease.

In aneurism a special diet is usually ordered, both the total amount of food, and the kinds that may be taken are carefully prescribed. The amount of both fluid and meat allowed is very limited, so that the diet is both dry and scanty. Aneurism usually attacks men, and chiefly those who have lived freely.

The heart causes death either slowly or suddenly. *Slowly*, by the blood stagnating on the venous side, and choking it up. Then we have, as a result, bronchitis, dyspnœa, dropsy, or ascites, and all the

symptoms of the veins being too full. *Suddenly*, by syncope.

By " hæmorrhage " is meant escape of blood from a blood-vessel, generally due to the blood-vessel being torn or cut across, or from ulceration destroying the vessel's wall and so opening it up. Hæmorrhage may take place into the air vesicles of the lungs, or into the bronchi, and then the blood may be coughed up. This condition is called "hæmoptysis," and may occur in the later stages of consumption or phthisis. Hæmorrhage may take place into the cavity of the stomach and cause nausea and the blood be vomited up. This is called "hæmatemesis." Also in some forms of disease there is hæmorrhage into the brain. Each of these forms of hæmorrhage will be again referred to in its proper place.

It is very difficult sometimes to distinguish between fainting and internal hæmorrhage.

Bleeding from parts or cavities with an external opening can be easily noticed, but there may be bleeding of closed cavities, *e.g.*, pleura or abdomen.

Symptoms of internal hæmorrhage.—Take for example bleeding:—

1. *Into the abdomen.*—The patient would complain of faintness, there will be increasing pallor with a small rapid pulse, and irregular breathing with occasional long sighing breaths, and at last unconsciousness.

2. In the case of the *aorta bursting*, as in aneurism, the patient would die at once, without any sign.

Loss of blood if sufficient in amount causes a

feeling of faintness, but of course this condition may be produced by other causes than loss of blood.

Besides loss of blood, fainting may arise from two causes :—

1. Emotional.
2. Cardiac.

Fainting from cardiac causes.—Here the fainting comes on suddenly. The heart is at fault in both cases, whether emotional or cardiac. In internal hæmorrhage it is the loss of *fluid* that causes fainting, not the loss of *blood*, and this loss can be effectually made up by the transfusion of other fluid, either blood or saline solution, which is of nearly the same consistency and specific gravity as blood, but does not contain any blood corpuscles.

Treatment of internal hæmorrhage.—One of the first and most important things to do is to try and calm the patient, who is naturally much alarmed, and his anxiety and fear cause the heart to beat more quickly, and thus increase the mischief, and of course if this goes on the blood has no chance of coagulating. Avoid stimulants, which must on no account be given unless by the doctor's directions. Place the patient in a horizontal position, as that enables the heart to beat slowly and quietly, and enables the blood to flow naturally to the head. Keep the patient very quiet, do not let him talk or move, in the hope that the blood will coagulate. Let the patient faint, as this will help to relieve the trouble, as the blood will have a better chance of clotting, and of thus stopping the hæmorrhage.

Treatment of fainting from emotional causes.—When the patient first feels it coming on, tell him to place his head between his knees, and get it as low as possible; this, by sending the blood to the head, will sometimes prevent fainting. If, however, it does not, and the patient actually faints, place him flat on his back, loosen anything which may be at all tight round the throat, such as collar or necktie, or over his chest, loosen the dress, and give him plenty of air and space, and do not allow people to crowd round if in a public place, if it can be prevented. As a rule, in a very short time, the patient will "come to," and a glass of water may be brought and given him to sip. If, however, the patient does not come round, then the chest should be uncovered and flicked with a towel soaked in cold water, and the hands and face may also be wetted, and smelling salts applied to the nose. It is much better not to give stimulants if the patient can possibly be brought round without; if he remain long in the fainting state, however, very occasionally they may be necessary. In every case they should be given with extreme care and caution.

Treatment of fainting from heart disease.—If the patient gets faint from sitting up in bed, the fact should be reported at once. It occurs sometimes when digitalis is being taken, and sometimes from a fatty heart, which is usually found in old people who become thin and have a yellowish complexion. In such cases stimulants are absolutely necessary. If the faint is long continued, get the head over the side of the couch, and pour water from a height

upon it. Chafe the limbs or place the hands in cold water, and raise them above the head.

In syncope or faintness in some forms of heart disease nothing can be done. The patient may fall down, and usually dies in a very few minutes from heart failure. Artificial respiration may be tried, however, for the chance of its doing good, and because nothing should be left untried.

Fits and drunkenness sometimes closely resemble fainting, and it may be difficult to distinguish between them.

As regards stimulants, when these must be given in fainting, the best is a diffusible stimulant, such as ammonia and ether, or it may be necessary to give a dessert-spoonful of brandy in an equal quantity of water, because it stimulates the mouth and stomach and thus, indirectly by reflex action, the heart.

The nursing of heart cases in general.—The most essential point in the nursing of all cases of heart disease is absolute and complete rest, by which not only rest of the body is meant, but also rest of the mind and freedom from anxiety, and the nurse can do much to secure this last by shielding the patient from trouble or worry of any kind whatever. As regards bodily rest, mere inactivity is not all that is required. The heart itself must be given as little work to do as possible, and it must be placed in the best possible position to do that work. For this purpose the horizontal position is the best, but if the patient insists upon sitting up on account of the difficulty of breathing, which as we have seen attends some forms of heart disease, he must be well

and carefully propped up, so as to avoid all strain and fatigue. In all cases, however, where it is possible, it is far better to lie down, and as flat as possible.

Another way to diminish the work that the heart has to do, is by lessening the amount of blood in the body. To do this the patient's diet should be as dry as possible, and very little liquid should be given at once. It can only be got rid of from the body by the kidneys, because the bowels are generally confined, and the kidneys depend very much upon the heart for their proper action. The bowels ought to be kept loose for two reasons: first, because the straining attendant on constipation is the greatest the heart can have, and hence patients with heart disease should be carefully watched, as they have been known to die in the lavatory from this cause: secondly, when the bowels are kept loose a large quantity of water is got rid of by them, which thus relieves both the work of the heart and that of the kidneys. The bowels should be relieved every day, or at least every other day, and if necessary laxatives should be given, but not purgatives. On the other hand, the general nutrition of the body must be kept up by all available means, but a heavy meal must be avoided, as it tends to distend the stomach, and embarrass the action of the heart.

In heart disease certain drugs are usually administered, and although the nurse has nothing to do with prescribing them, she should know something about their action, and the precautions she should take.

One of the most important of these drugs is digi-

talis, or foxglove, and when this is being given, especially in large quantities, the nurse must be extremely careful not to allow the patient to start up suddenly in bed, or move quickly for a little time after taking the drug. Digitalis strengthens the heart, and so the blood is driven more forcibly into the arteries and veins, and any sudden exertion may cause immediate death. Many deaths have happened in this way.

In the case of all persons suffering from heart disease, the great object at which we should aim is a steady, quiet, equable life. In all forms of heart disease the nurse must never give stimulants on her own account and without the doctor's authority, but should always enquire whether in case of necessity it would be dangerous to give them. In some forms of heart disease stimulants are desirable under some circumstances, in other forms of disease they are the most dangerous things that can possibly be given, and it is the duty of the doctor to decide this matter, and not the part of the nurse.

The action of alcohol.—The first parts affected by alcohol of any kind are the mouth and stomach; then it is absorbed into the circulation, and thus stimulates the heart and blood-vessels, and finally it affects the nervous system, and in three ways; first it stimulates the brain, causing the thoughts and language to become more excited; then if more alcohol be taken it paralyses first the lower part of the body, causing the staggering gait seen in half inebriated persons, and afterwards the higher part, causing the stupor of wholly inebriated persons.

LECTURE VII.

THE RESPIRATORY SYSTEM.

Respiration and the description of the Respiratory Apparatus—The composition of Air—Ventilation.

THERE is one kind of food which is extremely necessary to the support of man which is not taken in by the digestive system, but by the lungs. This is a gaseous food called oxygen; it is a colourless, tasteless, inodorous gas, and an adult man takes in $1\frac{1}{2}$ pounds of it during the 24 hours. During the same time he gives off about $1\frac{2}{3}$ pounds of carbonic acid gas, or carbon di-oxide, which is a compound of carbon and oxygen, and is a colourless gas with a peculiar but very slight odour. In addition to this we throw off by our lungs certain waste organic material, together with a minute quantity of ammonia and a large quantity of water in the form of vapour.

The process by which oxygen is taken into the system and carbonic acid gas is thrown off is called "respiration." There are various organs and parts of the body concerned in this process, but the chief are the "lungs" which are two in number, and lie in the chest or thorax one on each side of the heart, and do not fill completely the cavity of the chest. The lungs are two complex bags conical in shape,

with their bases resting on the diaphragm, and thrown up into folds composed of air-cells, and on their walls innumerable fine capillary vessels which bring the blood into close contact with the air, and this is the essential part of respiration. The lungs communicate upwards by means of a single tube, the trachea or wind-pipe, which leads in and out of them. The upper part of the trachea is called the larynx or voice-box, composed of cartilage and containing two cords placed so closely that they almost touch. The trachea is not composed of cartilage all round, but of horse-shoe shaped rings, the tube being completed behind by muscle. It divides into two branches called bronchi, one for each lung, and these again divide into two, and so on until they form very minute tubes called bronchioles; these finally end as blind dilatations, and contain large numbers of capillaries in their walls which are the ultimate ends of the pulmonary artery. If a frog's lungs be carefully studied they will be found to consist of very thin bags composed of a semi-transparent substance, and if removed and placed in water they will float, and it will be found very difficult to make them sink. The air reaches the lungs by two openings, the mouth and the nose which communicate with each other at the upper part of the throat, called the pharynx. The air breathed in goes down the trachea which is a tube about four inches long, and being formed of rings of cartilage is always the same size, then the air enters the two bronchi which carry part of it to one lung and part to the other, and so it reaches the dilata-

tion of the lung in due time. In coming out of a warm room into the cooler outer air it is always advisable to breathe through the nose, as the air has then to pass through a complex system of bones in the nostril, and it becomes warmed. It then passes through the mouth and larynx or upper part of the wind-pipe, the cartilaginous or gristly cavity which contains the glottis (or chink) with the vocal cords on either side. Within the larynx are two thin membranous folds, the vocal cords, and the triangular slit between them through which the air passes is called the "rima glottidis." By means of certain muscles the vocal cords can be drawn so close together that only a very narrow slit-like aperture is left between them. If air is drawn in or forced out when the cords are in this position, the vocal cords are made to vibrate, and thus sound or "voice" is produced.

The slit-like opening between the cords is the narrowest part of the upper air passage, so that if any inflammatory swelling occurs at this point or any membrane forms there, as in diphtheria, air will not be able to enter fully into the lungs, and so death may occur. The name "stridor" is given to the peculiar sound which is produced when air is drawn in through a very narrowed opening; it shows great danger and the patient may die suddenly. It always denotes that something is wrong in this part of the tube, and generally calls for tracheotomy. Hence it is very important that all nurses should recognise this symptom and know its importance. The bronchi have muscles in their walls as well as the

trachea, and sometimes they are attacked by spasms which cause difficulty of breathing, but this difficulty must not be confused with that caused by cardiac mischief.

All the walls of the air passages, the nose, larynx, and bronchi, that is the so-called "respiratory tract," are covered by mucous membrane, which is very vascular and lined with cells from which project minute hair-like threads called "cilia." These wave constantly, always outwards, their movements having the appearance of a field of corn over which the wind sweeps. Their object is to clear outwards dust and phlegm which would otherwise accumulate in the bronchi, and by carrying it to the throat it can easily be expelled. When the mucous membrane of the bronchi is inflamed the condition is called bronchitis.

By means of certain muscles the ribs can be raised and the chest cavity made larger. The diaphragm which is a membrane separating the chest from the abdomen is largely composed of muscular fibres. By its contraction the chest cavity is made deeper and so larger. When the chest is made larger a partial vacuum is produced and air rushes in through the wind-pipe to the lungs. The enlargement of the chest thus produced in all directions, which leads to air entering the lungs, is called "inspiration."

"Expiration" means the act of expelling air from the lungs, and is a passive action, the chest and diaphragm returning to their natural places by means of the elasticity of the various parts.

A woman breathes chiefly by her chest, this is called "thoracic breathing," whilst men and children breathe more by means of the diaphragm, and hence their breathing is called abdominal or "diaphragmatic." The difference in the method of breathing of the two sexes should be remembered when it is necessary to apply a bandage to any part of the chest, as in fracture of the upper ribs especially. In such a case a man can bear to be bandaged up more tightly than a woman.

The lungs are covered by a smooth membrane called the "pleura"; this is closely adherent to the lung and contains a very small amount of fluid, only just enough, in fact, to make it move smoothly. When the pleura becomes inflamed, and does not move smoothly, this state is called pleurisy. Sometimes in addition to the inflammation, we have fluid thrown out, and this is distinguished from the former as pleurisy with effusion. The lung is compressed by this fluid and consequently the air cannot enter freely.

Deep breathing is very necessary, and phthisis may often be averted when there is a tendency to it by this means, although when once established it cannot be cured thus. By encouraging children to take deep breaths, especially if, at the same time, the arms are raised and the hands rest on chair backs or other convenient supports, the weak parts of the chest can be strengthened in this way. Phthisis is not often itself inherited, but the weakness of chest which leads to it very often is.

Air is composed of various gases, the chief of which

in pure air are oxygen, nearly 21 parts in 100, and nitrogen, nearly 79 parts in 100; or 1 part of oxygen to 4 parts of nitrogen, together with a trace of carbonic acid gas, about 4 parts in 10,000, as well as minute quantities of other matters, but so minute in pure air as to be harmless. When air has been taken into the lungs and expired again, it becomes impure. The proportion of nitrogen does not alter, but the amount of oxygen is lessened, and the quantity of carbonic acid gas and other impurities immensely increased. The oxygen is now only 16 parts per 100, and the carbonic acid gas is 4 to 5 parts per 100; whilst the impurities are ammonia and organic matters, which give the room the peculiar stuffiness characteristic of an ill-ventilated room containing several people. Breathed air also contains a large quantity of moisture and is usually warmer than the surrounding air, as, when breathed out, it has become of the same temperature as the body. The amount of carbonic acid gas which makes air dangerous to health or life is 10 parts in 10,000, and in air that has been expired the amount is greater than this, and hence the need for ventilation. The carbonic acid gas is formed of the combination of the carbon of our bodies with oxygen, which produces carbonic acid gas within our bodies as it does without when the process known as "combustion" takes place, and in both cases heat is produced. This carbonic acid is a very heavy gas which sinks to the bottom of a room, and it is this which renders the lower part of some caves mines and disused wells dangerous, and often causes the

death of those who incautiously descend them. It is fatal to life, causing death by asphyxiation. To prove that the air we have breathed out contains carbonic acid gas, we should breathe through a tube into some lime water which is quite clear and in a minute or two it will become cloudy and milky looking. The carbon of the carbonic acid gas has mixed with the lime in the water, and has formed chalk or carbonate of lime, which is insoluble in water. Carbonic acid gas does not support combustion as oxygen does. The nitrogen is present only to dilute the oxygen, which would otherwise intoxicate us, and combustion would be so great that we should live too fast, and the waste of our tissues would go on so quickly that we should not be able to repair them with equal speed, and we should finally die.

The blood on entering the lungs is venous, containing little oxygen and a large quantity of carbonic acid gas; after it has passed through the minute capillaries it has gained oxygen from the air in the air vesicles, and has lost carbonic acid gas, which is breathed out again from the lungs through the air-passages. We have already seen that the hæmoglobin or colouring matter in the blood takes up the oxygen from the air, and that is why girls who are anæmic and have not sufficient hæmoglobin are breathless, because the blood is insufficiently aërated. When the blood has become venous the carbon and oxygen unite and form carbonic acid gas in which nothing can live or burn. This union of the two is called "oxygenation" or "combustion."

Arterial blood contains 20 parts of oxygen; 39 parts carbonic acid gas; and 1 to 2 parts nitrogen.

Venous blood contains 12 parts oxygen; 46 parts carbonic acid gas; and 1 to 2 parts nitrogen.

"Ventilation" means the regular and equable change of the air in a room without causing a draught. Children especially need good ventilation, as they give out carbonic acid gas and take in oxygen in greater quantities in proportion to the size of their bodies than adults do, and by this and other means young children pollute the air very considerably, and hence their rooms and wards should be even better ventilated than those occupied by adults.

It is very difficult to keep the air of a room sweet and pure without cross ventilation, especially if the room be small, and very often it is necessary to carefully cover up the patient with blankets, and even put a small covering over his face, whilst the doors and windows are thrown wide open for the purpose of renewing the air. This should be done three or four times a day, so as to thoroughly change the air. Never allow the chimney to be stuffed up, as it helps to form a current of air together with the small amount of air which is able to enter by ill-fitting windows and doors. This is not sufficient to be relied upon altogether, nor can it be a substitute for the thorough airing just described, but it prevents the air from getting quite so close as it otherwise would do. To increase the draught up the chimney a fire is an excellent thing, and except in very warm weather it is always well to have a small

one; or a lamp burning in the grate will increase the draught, and not give out so much heat as a fire. As a rule, the more simple the method of ventilation the more likely it is to succeed. An excellent and very simple plan is to open the lower sash of the window and insert a piece of wood the length of the window and 4 to 6 inches wide under the sash, this will give an opening between the two sashes at the middle of the window, through which air will enter steadily, not too much at a time, and being thrown upwards it will mingle with that in the upper part of the room and not cause a draught.

Unfortunately the body becomes accustomed to the impure air of a badly ventilated room, and therefore only a person coming fresh into it notices the want of pure air. Thus:—

If carbonic acid gas	=	4	parts in	10,000	the air is	pure.
,, ,,	=	6	,,	,,	,,	good.
,, ,,	=	8	,,	,,	,,	bad.
,, ,,	=	10	,,	,,	,,	dangerous.

The signs of bad ventilation are:—

1. A sense of closeness, caused by the organic products given off by the lungs.

2. Weight in the head.

3. Headache.

4. Loss of vigour or languor if the breathing of bad air is habitual, because the blood circulating in our bodies is impure.

Bad ventilation also causes or predisposes to such diseases as septicæmia, broncho-pneumonia in children, pleuro-pneumonia in adults, anæmia, &c.

Ventilation is one of the most important points to attend to in the nursing of diseases of the chest, as well as in all cases of fever, moreover a fever patient practically never catches cold. Patients suffering from bronchitis must be carefully guarded from draughts and from sudden changes of temperature. Except under exceptional circumstances the temperature of a sick room should not be below 60° F., or above 65° F.; 70° F. is certainly too high and the nurse should see that the temperature is kept equable. It is a great error to think that because air is warm it must necessarily be close and disagreeable. It is a great mistake to think that night air is bad. It is purer than day air, especially in large towns with many fires burning, but it is certainly colder and hence is dangerous for patients suffering from bronchitis and some other diseases, because it acts as an irritant on the delicate inflamed mucous membrane of the bronchi.

Flowers, or rather plants, are not desirable in a sick-room during the night, though they are during the day. Under the influence of sunlight during the day plants are able to take up the carbonic acid gas in the air, and decompose it, appropriating the carbon for their own use and throwing off the oxygen: hence they tend to keep the air pure. During the night, however, they give off carbonic acid gas and hence tend to add to the impurity of the air. It is not well to keep strongly scented cut flowers in a sick-room, and all flowers should be removed during the night, and brought back again in the morning, and the nurse should be specially careful

not to allow any withered flowers in the sick-room, and the water in the vases should be renewed frequently and not allowed to become in the least degree foul.

Hospital wards are not generally over-crowded with furniture and nick-nacks, but private sick-rooms very often are, and these are very objectionable because they lessen the air-space in a room and contract dust, and render the nurse's work in keeping her patient's room clean and pure, harder. The same applies to carpets and heavy curtains, which collect dirt and dust and are very difficult to keep clean, and therefore when possible, are best out of a patient's room.

LECTURE VIII.

The Nursing of cases of Disease of the Throat and Chest.

Croup and diphtheria—Tracheotomy—Symptoms of laryngeal mischief— Laryngitis — Bronchitis — Pneumonia — Pleurisy — Consumption—Suffocation.

The upper respiratory passages are the larynx, trachea and bronchi.

Diseases of the larynx are very varied. They chiefly give rise to difficulty of breathing owing to the space between the vocal cords becoming narrowed and obstructed. They are almost always accompanied by "stridor," and hoarseness or loss of voice.

The space between the vocal cords may become narrowed :—

1. By simple inflammation of the lining membrane of the larynx, or catarrhal croup.

2. By diphtheritic inflammation in which a false membrane is formed.

3. By spasmodic contraction of the muscles which normally approximate the vocal cords, or "spasmodic croup."

In diphtheria, however, the general system is infected by the poison, and it is therefore a more constitutional disease than croup.

In laryngeal obstruction an emetic is generally

given first, in order to make the child breathe deeply, and to stimulate the diaphragm, because this will sometimes remove the membrane, and cause it to be expelled. There is also another reason for the emetic, and that is that before and after vomiting, the patient takes a deep breath which causes the lung to inflate, the danger being that it may collapse.

Sometimes it is necessary to perform "tracheotomy," that is, to make an opening into the trachea, or wind-pipe below the obstructed part and insert a tube so as to admit air to the lungs. The object of this is :—

1. To give the child a chance of living till the membrane can be expelled.

2. To make death easier if it *must* occur.

In nursing cases of tracheotomy be careful to keep the tube clear of mucus, and watch the child so as to notice the first threatening of stridor, and then use a feather. After tracheotomy a tent is placed round the cot, and a steam kettle used to keep the air moist and the temperature even. When we breathe through the nose and mouth, the air is moistened by the mucous membrane, and is warmed by passing down the bronchi, and we use steam because we want to replace that moisture and warmth, otherwise the cold air passing through the tube and straight into the lungs will irritate them. Care must be taken, however, that the steam be not excessive. A temperature of between 60° and 65° F. should be steadily maintained, and a kettle of boiling water should be ready to refill the steam kettle

at the proper time. If cold or warm water be used, the temperature will go down before the steam can be re-established.

The inner tube will often have to be removed and cleaned, and a feather must be passed into the outer tube about $1\frac{1}{2}$ inches down to ensure its being perfectly free from mucus. Should the outer tube come out by accident, the nurse should not try to replace it herself, but should keep the wound open with her dressing forceps, until help can be procured.

The two chief symptoms of pulmonary mischief are:—

1. *Cough.*—This may arise from many causes, but it may be safely relieved by:—

(*a*). Warm moist air, as by having a bronchitis kettle going on the fire.

(*b*). By warm food, especially something warm to drink slowly. Warm milk, if it agrees and is not disliked, is very soothing to a cough, and a cup of it may be slowly drunk or sipped.

(*c*). Cough mixtures, such as "linctus." These, however, should only be used as a last resource and to relieve paroxysms of coughing, when these prevent sleep. Cough mixtures should also be swallowed very slowly.

2. The other symptom is *dyspnœa*, which may be constant or sudden. If the patient is liable to bad attacks, he should give notice to the nurse, who will give him something to hold on to, so that he can expand the muscles of the chest. A dose of aromatic spirit of ammonia and spirits of ether, half a drachm of each mixed with a fluid ounce of water will often

relieve dyspnœa, and it is a safe stimulant which acts rapidly, though its effects may only last a short time. Sometimes inhalations do good, or a blister to the chest may be useful.

Although cough is such a distressing symptom of lung disease, it must be remembered that it must not always be stopped, as it may be an effort of nature to rid the lung of irritating secretions accumulating in the air-passages. Sometimes opium is recklessly taken to relieve such a cough, and it certainly stops it, but there is danger that the patient's life may also be stopped. Hence opium in any form should never be taken or given to relieve cough until distinct leave from a doctor has been obtained.

In dyspnœa it is useful to apply warmth to the body and limbs, so as to promote a more rapid circulation of blood through the body, and increased oxidation.

In children with croup, diphtheria or whooping cough a dulness may sometimes be noticed, and they become stupid and tired. This is due to collapse of the lung, and death will ensue unless the lung can be expanded again by deep breaths, and for this purpose an emetic is given. In such cases, and also in the severe dyspnœa which sometimes accompanies whooping cough, ammonia and ether will also often do good.

Œdema is caused by a fluid which collects under the mucous membrane of the throat and obstructs the air passages. It occurs with very little warning, and is a complication or accompaniment in many

diseases. The breathing suddenly becomes very difficult, and death may occur suddenly. In œdema of the glottis stridor sometimes occurs.

Laryngitis is inflammation of the larynx, and this may give rise to œdema, but it does not often do so. In this disease, whether accompanied by œdema or not, as well as in œdema alone, it may also be necessary to perform tracheotomy.

There is one disease which at a post-mortem examination leaves no trace, and that is *asthma*. It is caused by a spasmodic contraction of the walls of the bronchi, and although it is very distressing to witness, it does not kill the patient.

Bronchitis is inflammation of the mucous membrane which lines the bronchi, and may be acute or chronic. In the latter case the chest sometimes becomes deformed. In all such cases the chief consideration is good ventilation. In bronchitis there may be collapse of the lung through the bronchi becoming blocked up with mucus; this is often relieved by an emetic.

Death from suffocation may occur in two ways, either suddenly, which is very painful to the patient, and also to the on-lookers, as consciousness is retained to the last; or slowly, as it usually does after tracheotomy, when the respiration fails gradually, and the patient falls into a state of coma, and dies without pain.

Pneumonia, or more correctly pneumonitis (since the termination "itis" always denotes inflammation), is inflammation of the tissue of the lung itself. It is attended by restlessness and fever, and sometimes

sudden and severe rigors may occur, the pulse varying from 140 to 160, the skin feeling dry and pungent, with a temperature of perhaps 105°. The breathing will be hurried and distressed, and the sputum rust-coloured. With the fever there will be the usual symptoms which accompany it, such as thirst, loss of appetite, and great prostration. In severe cases there may be some delirium. In nursing a patient suffering from pneumonia great care must be taken not to let the temperature of the room fall below 65° F., and it frequently relieves the difficulty of breathing if the air be kept moist by means of a bronchitis kettle on the fire, or other suitable method. If the temperature be very high, ice-cradling or cold sponging may be ordered. Cotton-wool jackets are very useful. The nurse must try to counteract the prostration by feeding her patient well, of course on liquid food, whilst the fever lasts.

Pleurisy or pleuritis is inflammation of the pleura, or fine membrane covering the lungs. Pleurisy may be "dry," or "moist" if fluid is formed. In bronchitis there is no actual pain, but in pleurisy there is practically always pain, although occasionally exceptions to this are met with, when there is an enormous amount of fluid and no pain. In ordinary cases of pleurisy, however, as each breath is drawn, it is like the stab of a knife. The membrane covering the lung is roughened, instead of being perfectly smooth, and when the lung is expanding, the roughened surfaces rubbing upon the chest cause the intense pain which is characteristic of this disease.

After a little while fluid is thrown out, sometimes in large quantities, and presses the lung inwards and prevents it from expanding, and therefore there is less friction, but more difficulty in breathing, and very little pain. Difficulty in breathing is caused not so much in proportion to how much of the lung is prevented from performing its proper functions, but according to how suddenly difficulty of breathing is caused in one lung. If this occurs gradually the other lung can take up the work, and difficulty in breathing will be averted.

If "tapping" has to be resorted to in a case of "pleurisy with effusion," as it is called when fluid is formed, always have a stimulant at hand, as the patient may feel faint when the fluid is removed, and this has occasionally even caused the operation to end fatally.

Consumption, or *phthisis*, or *tuberculosis* of the lung means a disease in which a slow inflammation and consolidation of the lung takes place, which gradually extends from the place where it begins to other parts of the same lung, or even to the other. After a time the lung substance breaks down, is caught up through the bronchi, and, forming the peculiar sputum of consumptive persons, is expectorated, and holes or "cavities" are formed, the process being called "excavation." In other cases these various processes follow each other rapidly.

Consumption is caused by an infective organism or microbe which gets into the system, and sets up inflammation. It lives in the lung substance, and is expectorated in large numbers in the sputum. So

long as the sputum remains moist this microbe is comparatively harmless, but if it is allowed to dry and crumble it gets into the air as minute dust, lodges on walls, &c., and if breathed by other people will set up the disease. This microbe has great vitality and remains virulent, that is, will cause consumption, even after several years. Hence the sputum must be carefully disinfected and should be disposed of by burning. Some disinfectant, such as carbolic 1 in 20, or corrosive sublimate 1 in 500, should be put into the spittoon before use. The patient should be warned never to expectorate into his pocket handkerchief but always into the spittoon. The handkerchief of a phthisical patient should not be sent to a laundry without having been previously allowed to soak for some time in carbolic solution 1 in 20.

There are many different varieties of consumption, some of which are curable, and some not. The cure, however, is always a very uncertain thing, and it is always more hopeful to prevent than to cure it when once established. Phthisis is to some extent infectious, and therefore a phthisical mother ought never to have her children in bed with her. Children who have a tendency to consumption must always sleep in good-sized airy rooms, which must be well ventilated both day and night, without causing a draught; they should be out in the fresh air a good deal, and must not be allowed to stoop forwards, nor to bring their shoulders forwards so as to contract the chest. Such children should be encouraged to take long deep breaths, keeping the chest well out, and raising

the arms and resting them on the backs of chairs or anything that may be convenient. Of course these breathing exercises are of little use if performed in close stuffy rooms where the air is foul, but are best done out of doors, or at least in a very airy room. Everything must be done, both in the way of exercise and of suitable diet, to increase the strength, and enable the child to resist the disease as far as possible.

Phthisical patients have a great dislike to all kinds of fatty foods, which, however, are extremely good for them, and hence, if the nurse can persuade them to take fats, it may be regarded as a sure sign that there is improvement. The great use of fats in consumption is that they counteract the wasting of the tissues.

In nursing a patient suffering from phthisis the nurse must be prepared for hæmoptysis, or bleeding from the lung, due to the bursting of a large blood-vessel. It often happens and may occur quite suddenly, and varies in degree according to the size of the vessel, from mere spitting of blood to a considerable and alarming flow. The very worst thing a nurse can do in such cases is to lose her head. A patient very rarely dies from the actual loss of blood, but sometimes he is so much alarmed by the appearance of the blood that he dies of fright. The nurse should calm and encourage her patient as much as possible, telling him to cough the blood up and that the attack will soon pass, and then he will feel better, and that a recurrence is unlikely. The patient must not be laid flat, but propped up in bed; ice should

be applied to the chest, and on no account must he be given any stimulants.

Suffocation means drowning in some gas, such as carbonic acid gas, ordinary coal gas, or carbonic oxide, these gases preventing the proper entrance of air into the lungs just as water does. When this occurs, the first thing to do is to get the foreign substance, whether water or gas, out of the lungs, and then to get them to fill with pure air. To do this, turn the patient *immediately*, and without waiting to take off his clothes, face downwards, place a roll of something under his chest, and press as hard as you can about his waist. Turn him over on his back, place the roll under his neck, see that the mouth and nostrils are clear, draw forward the tongue and see that it remains forward, and does not block up the back of the mouth and prevent the entrance of air into the lungs. Then stand behind his head, take hold of both his arms, press them as strongly as you can against the sides of his chest, then raise them slowly above his head and repeat. Do this fifteen or sixteen times per minute, slowly steadily and strongly for at least half an hour. If you have anyone at hand who can relieve you, this artificial respiration should be continued much longer, as people have been known to come to life again even after three hours of unconsciousness. If another person is at hand, the feet and legs should be vigorously rubbed upwards, and if they can be obtained, hot water bottles or hot bricks should be applied to the feet and body.

LECTURE IX.

Work and Waste—The Kidneys.

Generation of Force by Food—Excretory work by the Digestive System—Lungs—Kidney—Skin—Character of the Excreta—The Kidneys—Their Structure and Work—Retention and Incontinence.

The human body may be compared to a steam engine. In the latter coal is burnt or oxidised, this produces heat, and thus force is evolved which makes the engine work. The result of burning the coal is to produce ash, and this must be removed if the engine is to do its work.

So also in the body. The coal is represented by food which when broken up becomes oxidised and produces both heat and force, whilst the effete products produced in our bodies correspond to the ashes and must be removed, or our bodies will become choked and unable to do their work properly, and the individual's health will suffer in consequence.

Thus force is supplied by means of food which is given by various channels and is changed into various forms. The digestive system and the lungs are the chief channels of feeding, and the food taken in is either solid, liquid or gaseous, and is distributed throughout the whole body by means of the blood.

The food we eat generates three forms of force:—

1. Heat.
2. Muscular energy.
3. Nervous energy.

Mental activity is also closely connected with these three forces, but in what manner exactly we do not know. All we know is that if any of the above forces are deficient, mental activity suffers to a greater or less extent.

In addition to the actual quantity of food required to generate sufficient of each of the above forces, it is necessary that we should eat a certain quantity of food which shall not be digested, but be got rid of out of the system as waste products. The throwing off of these waste products is called excretion and is done by the excretory organs, viz., the digestive system, the lungs, the kidneys, and the skin.

By the digestive system we pass off the indigestible portions of food, part of which simply passes through the alimentary canal unaltered, the rest has become considerably changed in its course and is thrown off, together with a large amount of undigested vegetable fibre in the form of fæces. These are not useless, as might appear at first sight, but serve a very useful purpose in stimulating the bowels to action. Many of our most important foods are far too finely and carefully prepared, and it is a great mistake for healthy people to eat too largely of foods which are very much concentrated and extremely nutritious, with a view to reducing the amount of effete matter, as this causes constipation, and such a course if pursued for long, would seriously injure the health. The case is of course quite otherwise with persons suffering from disease, when perhaps the total amount of food which the patient can take is limited and must therefore be as nourishing as possible.

The digestive system also carries off the products formed in the body during the process of digestion, such as bile, &c.

The lungs throw off part of the waste products of the saccharine, starchy and fatty foods which have been oxidised to produce heat, and have been converted into carbonic acid gas. Both the digestive system and the lungs perform the double function of taking in food and giving out waste material.

The kidneys get rid of the waste of the albuminous or nitrogenous foods. These organs differ from the other two excretory organs, the digestive system and the lungs, in taking nothing in. The kidneys throw off their waste products in the form of urea and uric acid, and certain salts which are all soluble in water and together form urine.

The skin, like the lungs, throws off carbonic acid gas, various salts and large quantities of water in the form of perspiration. Like the kidneys thè skin does not take anything in.

It is very important that the nurse should acquire the habit of noticing the motions of her patients, and she should understand the significance and importance of what she observes, as the character of the motions goes far to tell the nature of an illness. A nurse should notice and report any change in (1) colour, (2) consistency, (3) shape, in the motions; also (4) the presence of pus, blood or worms. If the motions are grooved along one side, or very thin, you may be perfectly certain that there is something wrong with the bowel.

1. *Colour.*—This varies very much, even in health,

according to the kind of food that is eaten. In health it should be a clear yellowish-brown. If very pale, it indicates a deficiency of bile, which may be only temporary or may possibly indicate jaundice or cancer of the liver.

If very dark and tarry and partially digested, it may denote hæmorrhage into the upper part of the bowel. Whilst if there is bright scarlet blood in the motions it probably comes from the surface and low down in the bowel, and may indicate piles. The colour of the motions is also affected by certain drugs, and the nurse must bear this in mind. Thus:—

Iron turns the motions black.

Mercury also turns the motions black. With children, it turns them a green colour like spinach.

Bismuth turns the motions a leaden grey colour.

2 & 3. *Consistency and shape.*—The motions should not be either extremely hard, nor very soft or loose habitually. If the fæces are thin and elongated like a ribbon, or small and round like a pencil, there may be constriction in the bowel. If one side of the fæces has a deep groove, there may be some obstruction, this is seen in cases of cancer of the lower bowel. If the bowels are quite liquid with hard black lumps, it generally means chronic diarrhœa.

4. The nurse should observe anything unusual in the motions, or the presence of any extraneous matter such as pus, blood, or worms.

There are three kinds of worms which infest the bowel in man. These are:—

1. Tape worms, which are flat and jointed, and are passed in joints about one inch in length.

2. Round worms, which resemble garden or ordinary earth worms, and are pointed at one end.

3. Thread worms, usually found in the motions of children. They are about half an inch long, and are small and thread-like.

Tape worms.—This is a troublesome disease and it is very difficult to get rid of. These worms are jointed, each joint being from $\frac{1}{2}$ to $\frac{1}{4}$ of an inch long, whilst the whole worm often attains a length of from twenty to thirty feet. The head is about as large as a pin's point, and is furnished with suckers which stick to the walls of the intestines. The joints furthest from the head frequently drop off and are passed in the motions. After the administration of certain drugs many feet of the worm may come away, but if the head remains behind, after about six months the worm will grow again and attain its original length, and the joints will again be passed in the motions and the same process be repeated. Hence the great point is to get rid of the head. The best way to find out whether the head has been passed is to place the fæces in a fine sieve, stir them up with a stick so as to break them up sufficiently, let a stream of water flow over them so as to wash away as much as is soluble, and then to search minutely for the head. The nurse should do this somewhat disagreeable task conscientiously because when once the head is passed, then the treatment of the patient can be left off, as the disease is practically cured. When the nurse has discovered what she imagines to be the head of the tape worm, she should preserve it carefully for the doctor, so that it may be proved beyond doubt.

Round worms are smooth, with pointed head something like earth-worms, and generally affect adults.

Thread worms generally affect children. They probably live in the rectum, and produce excessive irritation, and are symptomatic of some other disease.

For thread worms an injection of about 2 pints of warm water and salt, in the proportion of two tea-spoonfuls of salt to every twenty ounces or 1 pint of warm water. These injections must be continued at intervals until no more thread worms are passed in the motions.

The kidneys are two in number, situated in the loin, one on either side of the spine.

There is a large artery and vein attached to each kidney which carries the blood to them to be purified by the removal of the waste products, and thence back to the venous system.

The veins and capillaries in the kidneys branch off into fine sub-divisions, which end in a sort of tuft, where the urea, uric acid and superfluous water are separated from the blood and pass as urine into the ureters, which are two tubes, one leading from each kidney into the bladder, here the urine is stored up and evacuated through the urethra.

The amount of urine passed varies throughout the day, according as it is passed before or after meals, after drinking much or little. It also varies with regard to the action of the bowels and skin, in cold weather when the skin is not acting much, the quantity is more, in hot weather when much moisture is

lost by perspiration, the amount of urine is less. The normal quantity is about fifty ounces in twenty-four hours, but there may be a great deal more or a great deal less than this amount. There may even be "suppression of urine," when none is secreted and the bladder is empty. This is a very serious condition, and if it continues, it means sudden death in probably less than nine days. A large amount of urine may mean two or three things. In one form of chronic inflammation of the kidneys, a large quantity of urine is passed, in another form the quantity is scanty. In diabetes there is generally a copious flow amounting to ten or more pints in the day.

In diseases where it is important to measure the quantity of urine passed in the twenty-four hours, the nurse must be careful that it is the whole amount that is measured, as the quantity can be easily falsified by the patient. Thus when the bowels act the patient must be instructed to pass the urine first, and in a separate vessel.

The *colour* of the urine varies even in health, from pale straw or clear amber to dark sherry. If it is black like porter, it is a sign of jaundice since it denotes that bile has got into the urine. If smoky or turbid, it means that there is probably hæmorrhage from the kidney, If port wine colour, it denotes hæmoglobinuria. If the urine contain bright red blood or clots, it shows that there is hæmorrhage lower down than the kidney itself, probably from the bladder or urethra.

The urine, like the fæces, has its colour affected by certain drugs.

The "reaction" of urine means whether it is acid or alkaline, and is important. This can be tested by two kinds of litmus paper, blue and red. If a piece of blue paper be put into the urine it will turn red if the urine be acid, whilst a piece of red litmus paper will remain red; conversely, a piece of blue litmus paper put into alkaline urine will remain unchanged, whilst a piece of red litmus paper will become blue. Hence the urine is reported as acid or alkaline according to its effect on litmus paper. Healthy urine should have a slightly acid reaction.

Specific gravity.—By this we mean the weight of a given quantity of urine compared with the weight of an equal quantity of water, which is the standard by which the specific gravities of liquids are calculated. The specific gravity of water is 1000, that of urine varies even in health between 1015 and 1025. If higher than 1025, and about 1040, it denotes sugar in the urine and the disease called diabetes; and if much below 1015 it also denotes disease. The specific gravity of urine is taken by means of a small instrument called a urinometer, it is a glass tube, narrow at one end, and having numbers marked upon it, and larger at the other end, and containing mercury or shot to cause it to sink in fluids. A narrow glass is filled about two thirds full of urine and the urinometer is put in, and the number to which it sinks is noted. There must be sufficient urine in the glass to float the urinometer.

When putting up a specimen of urine for testing, the nurse should carefully attend to the following points:—

1. That the vessel into which the urine is passed is perfectly clean.

2. That the glass into which it is put to preserve is perfectly clean.

3. That the glass is carefully covered over to keep out dust, &c.

4. That the right number is put on the glass, especially if there is more than one specimen.

5. That a fair specimen is taken. The best specimens are obtained by mixing the urine passed before and after breakfast; or better still, a specimen taken from all the urine passed during the twenty-four hours, put together in a perfectly clean vessel. If it should be inconvenient to keep the whole, part of what is passed at night can be added to part of what is passed next morning before breakfast, and a specimen taken from these together. In the case of a woman you should always save the second part of the urine which is passed.

Nurses, especially in hospital wards, frequently cleanse the vessels with a little nitric acid so as to remove any "fur" or hardened sediment. Care must be taken to rinse the vessels very thoroughly afterwards with plenty of water, as nitric acid would falsify the testing.

The sediment which appears after the urine has been allowed to stand for a time should also be noticed; it is very various. A scanty reddish deposit, like cayenne pepper, denotes uric acid; a yellow copious deposit, making the urine somewhat like pea-soup, is of little consequence generally, as it merely indicates the presence of urates. Then there

may also be pus, blood and mucus in the sediment.

There are sometimes certain constituents present in the urine which do not appear as sediments, such as albumen and sugar, but the presence of which are of grave import. These can only be discovered by applying certain tests. In testing for albumen nitric or acetic acid is used, preferably the former.

For sugar "Fehling's solution" is used. If some of this be added to the urine in the test-tube, and boiled over a spirit lamp, the blue colour given by Fehling's solution will be changed and a copious reddish yellow precipitate deposited. Fehling's solution that has been kept for a long time is of little use as a test.

There are three expressions which are frequently used and which should be clearly understood by the nurse. These are:—

1. Retention of urine.
2. Incontinence of urine.
3. Retention with incontinence.

Retention is when the urine is stored up in the bladder, instead of being passed. The bladder is consequently enormously distended, it may be pushed up as high as the umbilicus. This condition is very difficult to set right again. Retention often happens in surgical cases after an operation or in cases of paralysis, and very often also in enteric fever, especially when the patient is in a semi-comatose condition. If the patient does not pass urine, the doctor's attention should be called to the fact without delay, because it can be easily remedied

at the beginning by use of a catheter, but if the bladder once gets very much distended it very rarely gets quite right again, and the patient will probably be troubled with some form of "bladder trouble" for the rest of his life.

Incontinence is when the patient has lost control of the bladder, and the urine instead of being stored and passed only at intervals, cannot be retained in the bladder at all, but constantly dribbles away unconsciously. This is an extremely troublesome condition, and causes the nurse much anxiety on the score of bed-sores, which it is very important should not be allowed to form.

Retention with incontinence is when the urine is not passed naturally. The bladder is full to overflowing, and the urine is constantly dribbling but without emptying the bladder. This condition is also sometimes met with in typhoid fever, when the patient is in a very low semi-conscious state.

In some cases of paralysis incontinence of both urine and fæces occurs, due to loss of control over both the bladder and the rectum.

LECTURE X.

Kidney Diseases and their Nursing. The Skin.

Common causes and results of Kidney Disease—Description of the Skin; its uses and properties—Clothing.

It is very rare indeed for kidney disease to cause pain in the situation in which the kidneys are placed. There are, however, a few kidney diseases in which this is the case, but they are by no means the most serious. There is a close relationship between the skin, the bowels and the kidneys. The skin may be described as an external kidney, the kidney as an internal skin. The bowels are also an excretory organ, and when the kidneys are diseased, the skin and the bowels are made to act more fully than usual by the use of cathartics, and the skin is stimulated to greater activity by the use of drugs and by warm and vapour baths.

The great object in kidney disease is to give the diseased organ as much rest as possible, and as the waste products must be got rid of somehow, as already said, we give as much work as possible to the skin and bowels, the "complementary organs" of the kidneys. We can also lessen the work of the kidneys by giving as small an amount as possible of albumen or nitrogenous food, because the waste from this food is almost exclusively excreted by the

kidneys. The causes of kidney disease are various, sometimes the tendency is inherited, sometimes it is very difficult to trace it to any cause. One very fruitful source of kidney disease, however, is an *excess of nitrogenous food.* Most northern nations eat far too much meat, and particularly in England, where three full meat meals a day is the rule. If the kidneys are very strong and healthy, this does not affect them, but if they are weak, disease is very likely to supervene. People of a sedentary habit of life should never eat more than one full meat meal in the day, and should take some lighter form of meat, such as ham or bacon, for breakfast. In kidney disease, a hydrocarbon diet is advisable which consists of a very small amount of nitrogenous or albuminous foods, but chiefly of fat and starch. The ideal food is milk, although this contains some albumen.

Kidney diseases are either acute or chronic. There are two forms of chronic disease (*a*) Bright's disease, with dropsy, and where little urine is passed; (*b*) Bright's disease, without dropsy, and where much urine is passed.

The acute form occurs after scarlet fever and is characterised by swelling of the legs, which "pit" on pressure.

One of the most common results of kidney disease is dropsy. This is caused by the watery part of the blood passing out of the blood-vessels into the tissues beneath the skin or the "subcutaneous tissues;" hence when the skin is pressed an impression is left. The fluid generally collects in the legs and

feet, also in the abdomen and the tissue surrounding the eyes, that is wherever the skin is loose. The reason why the fluid usually collects in the legs and feet is that these parts being furthest removed from the heart, the venous circulation is usually slower than in other parts, and thus the watery part of the blood has more time to make its way through the tissues.

If an incision has to be made for dropsy in kidney cases, it means that the patient is in a very serious condition. It is a trifling operation in heart cases, but in kidney disease it generally means a forlorn hope because the skin is in such a bad state that the least cut may set up inflammation or erysipelas. The nurse should be careful to keep the region around the incision well dried and soft with ointment.

The Skin.—The skin covers the whole body, becoming very thin at the lips and eyes, where it more nearly approaches in character the mucous membrane which lines the whole of the alimentary and respiratory tracts and other parts of the body.

The skin consists of two layers :—

1. The epidermis, "scarf skin" or "cuticle," which is the outer layer.

2. The dermis, or "true skin," lying beneath the epidermis.

The epidermis is composed, on its outer surface, of layers of thin, flat, horny scales laid one upon another, which are constantly being rubbed off as very fine dust. It contains neither blood-vessels nor nerves, and is therefore quite insensitive. Imme-

diately beneath are the deeper layers of the epidermis, consisting of thicker scales, whilst the lowest layer of all contains quite rounded cells, which are more juicy. These various layers come nearer to the surface as the outermost one gets rubbed off, and become more scaly and dry, and thus each in turn gets rubbed off by degrees. The new cells are always formed in the lowest layer, and here too are certain cells which contain minute granules of colouring matter and are called "pigment cells"; to these is due the colour of the skin. They are more numerous and contain larger quantities of pigment in the skins of the dark people who inhabit tropical countries. The use of the epidermis is to protect the more delicate dermis beneath it.

The dermis is composed of connective tissue, with interlacing muscular fibres and flat cells. It also contains large numbers of blood-vessels, small arteries, veins and capillaries, nerves, and two kinds of glands.

1. The sebaceous glands, which secrete a fatty substance called "sebum."

2. Sweat glands, which secrete the perspiration.

The nerves in the skin are very numerous and run in projections or papillæ very like the fingers of a glove, and close up to the surface of the skin; the different fingers being separated from one another by connective tissue and cells. If the tops of the fingers are carefully examined, these tiny papillæ may be seen as ridges, and are particularly clear if a lens be used. It is this special arrangement of the nerves which makes our sense of touch so very keen

and discriminating. The blood vessels and nerves are so numerous and form such a close network in the dermis, that it is impossible to prick, cut, or scratch the skin in any part without causing pain and drawing blood.

The sweat glands are coiled up little tubes, set closely side by side, and opening out on the surface of the skin in little holes. These glands are more numerous in some parts of the skin than in others. The sebaceous glands are especially numerous on the head, in fact a sebaceous gland is always found close to the root of a hair which is thereby nourished and lubricated. The sebum, or soft, semi-solid, fatty substance, which these glands both secrete from the blood and pour out, is spread over the surface of the epidermis, and helps to keep it soft and supple, and prevents it from becoming dry and harsh, and liable to crack, as it often does in cold weather when the action of the glands is interfered with.

The sweat is composed chiefly of water with a small proportion of carbonic acid, soluble salts and other substances, probably including some gaseous matters. These waste materials, which would do harm if they remained in the blood, are separated out by these sweat glands and discharged on to the surface of the skin.

The hair and the nails are merely modifications of the skin. The uses of the skin are :—

1. It is one of the excretory organs of the body, its function being to throw off some of the waste products of the body in the form of perspiration.

2. It forms an attachment for muscles.

3. It is a protective covering to the parts beneath.

The skin ought to be soft, plump, supple and moist, and a nurse may learn a great deal from its condition. When it is hot, dry and pungent it indicates that all is not well, and this is specially the case if there is also a high temperature. There is little danger from a high temperature alone (apart from the disease itself) so long as the skin is moist and perspiring, but there is considerable danger if there is both high temperature and a hot dry skin. Then there is the cold, perspiring skin of collapse, called "cold sweat," which is found after loss of blood or fainting, and the peculiar acid smelling perspiration associated with rheumatic fever, or acute rheumatism. Again in some cases of obstruction of the bowels there is a distinct fæcal odour about the patient.

When the skin has a withered appearance you expect to find symptoms of either cancer, diabetes, or consumption.

The hair must be kept very clean, or the orifices of the sebaceous ducts get choked up with the debris of the skin. The skin of the head behaves exactly as does that of the rest of the body. The flat, dry scales of the outermost layer become loosened, but, owing to the hair, they are not easily shed, and these constitute the so-called "scurf." This is particularly likely to accumulate in a patient's head, and should be guarded against by attention from the very first when a little trouble expended every day will keep matters right and will not weary the patient.

The power that the skin has to absorb various materials applied or rubbed into it must be borne in mind in connection with the hair. Many hair lotions and most hair dyes contain poisonous substances, frequently lead, and by means of these, if persevered in for a time, a person can be poisoned and the health very much injured.

If the skin of the head be kept free from debris and the hair itself clean, it should not require lotions to make it grow properly. The hair will be affected by the general health, and to keep this thoroughly good is the best way to ensure its being healthy and growing properly.

Likewise, as regards the patient's nails, these should be kept nicely cut and be cleansed daily with a nail-brush and soap and water. A pen-knife or a pair of scissors should never be used for cleaning them by scraping between the free edge of the nail and the skin. It is no doubt a rapid and effective method but it is also an idle one, and by loosening the nail lower down it makes a larger space for dirt to accumulate in next time. When the nurse has to do any dirty work, she should remember what a trap for carrying infection her nails may be, and she should therefore devote special attention to cleansing and disinfecting them. In some cases it is a very good plan to fill them with soap or some disinfecting ointment, so as to prevent anything getting down between the nail and the skin.

Considering the very important functions that the skin has to perform, it is quite clear that we must do all in our power to make it perform its duties pro-

perly. One of the chief deterrents is want of cleanliness. If the openings of the sweat glands get blocked up with the debris of epidermis, together with the oily material of the sebaceous glands, the perspiration cannot be discharged but has to remain in the body, and the health will be injured. It is a well-known fact that if the skin were varnished over, so as to prevent the escape of perspiration, a person would soon die. Similarly if we allow the openings of the sweat glands to be blocked up, we shall seriously injure our health. The care of the skin is of special importance to a patient, who must be given every possible chance of recovery, and the nurse can, with care and skill, so perform the daily ablutions of her patient as to keep the skin perfectly clean and able to do its work efficiently, and at the same time neither chill or weary her patient.

An important point is to change the linen with sufficient frequency, especially the night-dress. It must be remembered that the clothes absorb what the skin gives off, and hence it cannot be very healthy to keep linen soaked in these matters in contact with the skin which can itself absorb substances very readily.

No doubt the very best kind of underclothing for everyone—adults, children, elderly people and invalids, is that which is composed of wool. The underclothing of children especially should be warm, and care should be taken that the extremities are sufficiently clad. A child with short sleeves and socks runs very great risk both of catching cold and of laying the seeds of serious disease in after-life. If

a child has weak kidneys, even if there be no disease as yet, and nothing in fact to draw attention to these organs, kidney diseases may readily be developed by such exposure. Little children, even those who appear strong as children go, are really so frail and delicate and have so little vitality, that it is a very serious matter to chill the blood to such an extent as is done by bare legs and arms, and thereby to rob the body of much of its natural warmth.

The advantage of wool as underclothing is that whatever the weather the body cannot be subjected to sudden and severe changes of temperature.

A person suffering from kidney disease should always be kept very warm, and should sleep between blankets.

Day and night clothes should be thoroughly well aired before being put on again.

Thus we have seen how the lungs, skin, kidneys and bowels all act together and all throw off effete matter, and if one fails, the others will often become more active and take up the work of the one that fails. Therefore in cases of kidney disease when the excretion of urine is imperfect, the following rules should be carefully carried out:—

1. Make the patient's room warm so as to increase the action of the skin.

2. Make the bowels act regularly.

3. Help the breathing. This is generally best when the patient can be up and about, and therefore a patient should not be confined to bed unnecessarily.

LECTURE XI.

Skin Diseases.

General Characteristics of Skin Diseases—Burns—Scabies—Ringworm—Pediculi—Bedsores—Applications to the Skin—Blisters—Ice—Poultices—Fomentations—Baths—Packs—Sponging—Lotions.

Skin affections may be divided into the two following classes :—

1. Those affecting the epidermis, which may leave no scar.

2. Those which affect the true skin, which generally leave a scar.

So long as the disease is confined to the epidermis there is no scar, but if it penetrates deeper, so as to affect the true skin, then a certain amount of scar must result. For example, in small-pox the dermis or true skin is attacked, and the result frequently is pitting, but in a slight burn or scald only the epidermis is affected, and when the blister has been snipped, and all the fluid let out, it heals up perfectly, and leaves no mark whatsoever.

As we have already seen, the lower layers of the epidermis consist of round cells, and these as they in turn reach the surface, flatten out and become horny. Sometimes, however, these cells do not come to maturity, but abort or die prematurely. Consequently they do not come up to the surface to protect the dermis, but by dying, leave it bare, and the

vessels beneath exposed to the air. Fluid from the blood exudes in little drops on the surface, and forms a scab, which collects all sorts of dirt. This form is called "weeping eczema," but there are a great many different forms of this affection. Hence eczema may be called a catarrh of the skin, and is, unfortunately, a very common and very troublesome disease.

To prevent this abortion of the epidermal cells, we must carefully protect them from all injury, also from cold, water, soap, or friction.

Treatment.—There is no use in applying any remedy until the scab is removed, and in all skin diseases where scabs or crusts form, the first thing to do is to remove them. Thus in eczema there are three things to be done :—

1. Carefully remove the scabs, either by means of poultices, fomentations, or warm oil.
2. Try to prevent the scabs from forming again.
3. Keep the skin covered with simple ointment.

Eczema being an affection of the epidermis only, though presenting a bad appearance, may be perfectly cured, and leave no trace whatever.

Eczema of the eyelids is a common form of the disease in children.

Burns may be divided into two great classes, according to degree, thus :—

1. Those which are mere surface burns, and only form a blister, by which is meant the separation of the epidermis from the dermis by fluid which has exuded from the blood vessels. These leave no scar, and the patient almost certainly recovers, unless

the burn has extended over a large surface, when "shock" may cause death, because so many nerves have been exposed to injury.

2. Burns which are deep enough to extend to the dermis or true skin, when scars and contractions are the result, caused by the tissue which is formed during the inflammation.

Treatment.—Cover up with any oil or ointment at hand, or as a last resource even with flour, with cotton wool or linen over. The great object is to exclude the air, which causes great pain. The most important point in the case of extensive or deep burns is to counteract the "shock" and collapse which nearly always result. Put the patient to bed at once between hot blankets, and apply heat to the body in every possible way. Give the patient some hot milk and brandy.

Scabies or *itch* affects the parts between the fingers and toes in adults, and the buttocks in children—also the wrists.

Its characteristic symptom is intolerable itching, which becomes worse at night after the patient gets warm in bed. It is often accompanied by a rash caused by the irritation, or eczema, and it may thus be difficult sometimes to distinguish between the two. Itch, however, may usually be recognised by a thin wavy line along the inside of the finger or toe, having a small globule at the end. This is caused by the itch insect, which always forms sinuous burrows under the skin in ridges, laying its eggs as it goes along. The burrows are dotted with little black dots or points, and end in a globule or slightly

raised vesicle where the insect takes refuge, and from which it may be extracted by pricking the vesicle with a needle.

This disease requires a suitable "nidus," viz., dirty skin, and a certain amount of lodgment against the skin. Hence, though a highly infectious disease amongst dirty people, there is not the slightest danger of a nurse catching it when attending to a patient suffering from it.

Sulphur baths and the application of sulphur ointment are the usual treatment ordered for the cure of this disease.

Ringworm is practically confined to children. In adults it attacks the body, and hardly ever the scalp; in children it almost always affects the scalp. It is usually circular, appearing in round bald patches, and will gradually extend until it covers the whole scalp. The bald patch is always scurfy or scaly, with short, stubby, opaque hairs covering it, at the root of which may be seen the peculiar fungus forming the disease, and which passes down into the hair follicle. To see it one of the hairs must be pulled out and placed in a watch-glass with some liquor potassæ, and the fungus will be readily seen under the microscope. If this fungus has penetrated deeply into the scalp it is very difficult to cure, and in being cured it may leave scarring and baldness. It sometimes takes five, six, or even ten years to cure this disease. Ringworm is extremely infectious, and it ought to be reported at once when noticed, as it spreads very rapidly amongst children, and will run through a whole ward.

Always get leave to cut the hair off at once; it will have to be done in the end, if not at first. The ointments or lotions ordered must be applied regularly and carefully; a linen cap should be kept on the head, and the child carefully isolated from other children.

Patchy baldness is a peculiar form of baldness or "alopecia" which is very like ringworm, but differs from it in that the patches are absolutely bare, though perfectly smooth, and without scales, and the hairs, when there are any, are not so stubby, but very fine and silky, like down. Moreover, patchy baldness is not infectious.

Eczema on the scalp is scaly like ringworm, but never shows short stubby hairs.

Lice may be divided into two classes :—

1. Those which infest the head, or the Pediculus capitis.

2. Those which infest the clothes, or the Pediculus vestimentorum.

Pediculus capitis, or lice in the head, are very common in hospital patients, but they show themselves quickly. Frequently children with dry heads are so infested that the back of the head is covered with crusts under which the lice live, and even the glands of the neck may become enlarged. When this is the case the hair must be cut off, and the crusts removed as in eczema, by poulticing or fomentations, or by warm oil, and then the parts beneath anointed with carbolic oil. If they are very numerous and in the hair, pour some chloroform on a cloth and wrap it round the head. This will stupefy the lice, and they can then be brushed out, and the

head washed well with carbolic oil, 1 in 20, which will kill the creatures themselves, and the head can afterwards be thoroughly washed with plenty of soft soap and water, and combed with a fine comb. This treatment, however, is not sufficient to destroy the eggs or "nits." To do this, apply first of all methylated spirit, or spirits of wine, or any other spirit you have at hand, to dissolve the peculiar adhesive or cement-like substance which fastens them to the hair; the head should then be well washed in carbolic lotion, 1 in 40, comb thoroughly with a very fine comb, and let the patient wear a carbolic cap. The nurse must not be too ready with her scissors in snipping off patients' hair, as it is actionable to do so.

Pediculus vestimentorum, or the lice which infest the clothes, are not very easily seen. They are most easily seen in the patient's clothes. They are found chiefly round the neck and between the shoulders, where you will probably see long scratches where they have been. In the clothes they live in the seams, and about the collar. If possible the clothes should be destroyed by burning, but if not they must be thoroughly boiled or baked.

Sometimes these lice cause so much irritation that erysipelas supervenes, but such cases are rare happily.

Besides these there are other skin diseases of a terrible character, and extremely infectious, such as *syphilis*. If a nurse has to do with a patient suffering from this disease, she must be very careful indeed to cover up any scratch very thoroughly, and should

frequently disinfect her hands. Nurses have unfortunately acquired this disease from no fault of their own, but merely from being ignorant of its extremely infectious character, and from consequent neglect to take the necessary precautions.

In addition to the skin affections already mentioned, the so-called "eruptive fevers" have each a characteristic rash, but of these we shall speak in connection with fevers in a subsequent lecture.

A very troublesome affection, and one which may end fatally, is the condition known as "hæmophilia;" persons suffering from this disease are popularly called "bleeders." If such have a cut, or even a tooth extracted, constant bleeding follows, which is very difficult, if not impossible, to check.

Bedsores are the result of continued pressure on one part of the skin, whereby the blood-supply is cut off, and as a consequence not only the epidermis but even the dermis, or true skin, dies from want of nourishment and sloughs. There are all degrees of what are called bedsores, from a slight abrasion of the skin caused by the part being damp, or by some roughness or wrinkle in the bed clothes, down to the deep slough. The important point for a nurse to remember is the cause of bedsores, and to counteract it as far as possible. Bedsores are liable to come where there is most pressure, that is, over prominent bones, and hence we look for them in the small of the back or on the hips, on the shoulder-blades and heels, and sometimes even on the back of the head, though this is rare. They may also be found on the elbows. All these parts must be well rubbed

twice a day, the addition of methylated spirit or other applications to harden the skin is good, but the essential part is the *friction*, to increase the blood-supply to the part, and provide due nourishment to the skin, and it is the duty of every nurse to do this conscientiously. Do not rub starch powder into the bottom sheet with a view to prevent bedsores, nor dust it over the skin; it is useless, because it does not go to the root of the evil. The powder makes a great mess, and when the bed has to be made it gets about the room as dust, and is uncleanly, carrying with it effete products from the skin. To dust powder over the skin merely conceals any redness of the skin which should at once be a danger signal to the nurse. When once a bedsore is formed, the matter must be reported immediately to the doctor, and will require very careful dressing likè any other wound, and the applications ordered must be conscientiously applied.

Applications to the skin.—Ointments must be gently rubbed in to ensure their penetration through the outermost layer of the epidermis, and the part should then be covered with a piece of rag or lint, on which some more of the ointment may be spread.

Blisters are of two kinds:—

1. Mustard plasters.
2. Fly blisters (cantharides).

A mustard plaster acts at once, and should not be kept on longer than 20 to 30 minutes, according as the patient can bear it. With some persons mustard plasters cause so much pain that they cannot be borne for even 20 minutes. In such cases the

plaster should be kept on as long as possible, and then removed and a linseed poultice applied, which will continue the effect, but in a less painful manner. If the mustard has made any part sore, that spot should be dressed with a little simple ointment, (see Appendix), and if the tingling and burning is very great after the removal of the plaster, a little simple ointment may be applied to the whole surface. The mustard papers which can be readily obtained from any chemist are the best and the most satisfactory, but if the old fashioned kind, made of mustard and spread on paper, have to be used, the nurse must remember that, unlike the mustard paper, it must not come in direct contact with the skin, but a piece of thin muslin or of tissue paper should intervene.

A fly blister (or cantharides) does not begin to act for from six to ten hours after it has been applied, and sometimes it does not act at all. This is generally because the skin is greasy, and therefore it should always be thoroughly well washed with soap and plenty of water, care being taken to remove all the soap. The part where the blister is to be applied may further be washed with whisky or other spirit, or with chloroform or ether, to make sure that all the grease is removed, and this is specially necessary if any remedy of a greasy nature has been applied previously.

Fly blisters can be applied in two forms, either as a plaster or as a fluid to be painted over the part. When a blister is to be applied, the doctor will indicate the exact spot and size. If the plaster be used it must not be fastened down too closely with a band-

age or pieces of sticking plaster, otherwise the blister will not rise properly. If the fluid form be used it must be carefully painted on with a camel's hair brush.

Blisters must never be applied actually over a joint but above and below it. When a blister has risen, the vesicle should be snipped at the lowest part, and the fluid allowed to flow out on to a piece of rag. Care must be taken to completely empty the vesicle, or it will fill again. Afterwards a little simple ointment may be applied on a piece of lint. Occasionally the thin skin of the vesicle is directed to be removed altogether, and special ointments or lotions applied. This is when it is necessary to keep the blister "open."

The purpose of blisters, whether mustard or cantharides, is to produce counter-irritation, or dilatation of the blood vessels on the surface of the skin, so as to withdraw some of the blood from the interior, and relieve the internal inflammation. This also tends to divert the pain from the inflamed part to the surface of the skin, as in pleurisy.

It is best not to apply a blister over the affected part, but near it, because if the skin is too much inflamed by the blister, the inflammation will extend to the affected part, and will make it worse.

A fly blister must never be left on an unconscious patient.

Ice, as a rule, must not be applied persistently, because it loses its effect. It is better to take it away for about ten minutes and to replace it. It is also better to put ice *near* the place for which it is intended, rather than immediately on it. For in-

stance, an ice collar is preferable when ice has to be applied to perhaps an injured head, rather than an ice cap.

Ice should never be placed in direct contact with the skin, but a piece of linen or lint should always intervene, except when applied to the head, when the hair is sufficient protection.

Poultices have been almost entirely banished from surgical wards, and are replaced in great measure even in medical practice by sheets of cotton wool. In some cases, however, and notably pleurisy and pneumonia, nothing is so soothing as a well made linseed poultice, of the proper consistency, which does not stick to the skin, and applied as hot as the patient can bear it. If the patient is emaciated, and the bones prominent, and the skin over them only very thin, much pain may be caused by a poultice, which, though not too hot to be easily borne in other parts, causes intolerable burning over the bony prominences, and thus the nurse has either to apply a poultice which burns in these parts, or which is not hot enough to do much good. In such cases, a little simple ointment applied over the bony prominences will enable a hot poultice to be borne without pain or discomfort.

Fomentations are much more used now than poultices, especially for wounds. They are cleaner, and have the great advantage that by using special lints prepared with disinfectants, a wound can be treated antiseptically at the same time. The disadvantage is that when steady warmth is to be applied, a fomentation cools more quickly than a poultice.

Baths are of four degrees :—

1. Cold, varying from	65°	to	70° F.
2. Tepid, ,, ,,	80°	,,	90° F.
3. Warm, ,, ,,	90°	,,	100° F.
4. Hot, ,, ,,	100°	,,	110° F.

A hot bath affects the whole surface of the body. No patient should be left alone in one, because of the danger of fainting, neither should he remain in longer than ten minutes. Care must be taken not to scald the patient, hence cold water should be put in first, and then the hot. Be very careful to wrap your patient up well, and avoid all chills afterwards. Avoid keeping a patient too long in a cold bath, as the reaction will not take place, and congestion of some internal part may occur ; if reaction does not occur and the patient is chilly and miserable, put him back to bed between hot blankets, apply hot water bottles to his extremities, and give him some hot weak tea to drink.

Turkish baths are a potent remedial agent and must never be given without a doctor's orders. When they are to be given they should not be hurried over, and at least three hours should be taken over one.

A vapour bath may be given in a private house according to Simpson's method, which is a very convenient one and does not require any complicated arrangements. All you require are hot water, soda water bottles, corks, and stockings, and the method is as follows :—No preparation of the bed is required, the patient is in bed as usual, but wrapped in a blanket. The soda water bottles are then filled

with hot water, and tightly corked; the stockings are wrung out in hot water, and drawn over the bottles, which are then placed in the bed all round the patient.

Then, too, there are various forms of "medicated baths" which must be given according to the doctor's directions. A list of them is given in the Appendix.

Other methods by which dry heat may be applied are hot sand, salt, bricks, or a hot plate, but these are for the most part superseded now by hot water bottles, which are more convenient in every way, and far more easily and quickly obtained.

Wet packs.—These are of two kinds, cold or hot. The bed must be covered with a large mackintosh, and a blanket placed over it, then the patient's night-dress removed, and he should be wrapped in the blanket. A sheet should be wrung out in cold, iced, or hot water, at 110° F. if for a hot pack, and wrapped round the patient under the blanket, and finally he should be well covered with other blankets, and tucked up. A wet pack reduces temperature very effectually as a rule, and is very soothing. A patient may be left in it for half an hour.

Sponging is often resorted to in order to reduce fever. It may be tepid, cold, or iced, according to the temperature of the water employed. The patient's nightdress must be removed, and a light blanket put over him, and a basin of water, sponge, and soft dry towel should be at hand. A portion such as one arm, or the chest, is sponged at a time, and dried at once by gently dabbing, and so on till

the whole body has been sponged. With care the process need not be fatiguing, and the bed clothes must not be in the least damped.

Other methods of reducing temperature are by *ice-cradling*, when a long "cradle" is placed over the patient, under the bed clothes, the sheet only being drawn over it, which must be so arranged as to secure decent covering, while allowing a through current of air. On to the cradle, and under the sheet, are hung a number of little tin buckets (those used by children are very convenient) filled with ice.

Evaporating lotions are generally used to relieve inflammation in some special part of the body, and not to reduce temperature. Care must be taken to change the lint or rags frequently enough, two sets should be in use at once, one kept soaking in the lotion, whilst the other is applied, otherwise when the rag is taken off and put into the lotion, and then at once replaced, it is not properly cooled.

LECTURE XII.

TEMPERATURE.

Significance of Temperature—Rigors—What is Heat—Regulation of Heat in our Bodies—The Clinical Thermometer—Taking Temperatures.

WHAT do we mean when we speak of temperature? *Temperature* of a body means the hotness of that body, as measured by the greater or less extent to which it can impart sensible heat to other bodies. It is this that we test by means of the clinical thermometer.

The average or "normal" temperature of the human body is 98·4° Fahrenheit or 37° on the Centigrade thermometer. All living bodies do not have the same temperature, some take their temperature from the surrounding air, such for example as the frog. Its temperature and that of other so-called cold-blooded animals varies between 45° and 100° F. Other animals are warmer blooded than we are, and have a higher temperature, such for example as the swallow, 111° F., which is higher than our fever temperature. Even in human beings, there is a difference of temperature at different times of the day, and at different ages, and without necessarily any departure from health. An infant's temperature is higher than an adult's, being normally 100° F., in the mouth and rectum. Also in the twenty-four hours the temperature varies somewhat, being highest in the afternoon as a rule, and

lowest in the small hours of the night. With an infant, during sleep, there is a slight fall of from half to one degree, and a rise of a degree or more during crying.

Children and old people are more susceptible to changes of temperature, and are profoundly affected by cold and chills, which would have little if any effect on healthy adults, and therefore greater care must be taken to prevent their exposure to such changes. Prematurely born children, say for instance of only seven months, are especially susceptible, and if they live, which is the exception, they require the very greatest care, and this is very largely due to the great difficulty in keeping them warm. In some countries, especially abroad, such children are kept in an "Incubator" where the temperature is kept up steadily, but wrapping them well in cotton-wool and keeping them in a warm room is often sufficient. Instability of temperature is always incompatible with health and is characteristic of disease, but in health certain limits are met with, such as 97·5° F. and 99·5° F. which with some people is a "normal" temperature. The limits, however, to which it may fall or rise in disease, when it is incompatible with life, are 96° and 110° F. If above or below this you may be pretty certain that the patient will die. Above 99·5° indicates more or less fever, 110° is absolutely incompatible with life, and if the temperature remains at 107° for an hour or so the patient is almost sure to die; 105° is a dangerous temperature, and ice baths or some other means of reducing tempera-

ture should be tried. If there is much fever, there is a corresponding amount of rapid waste and disturbance of the heat regulating apparatus of the body, the secretions (saliva, perspiration, urine) are lessened, and the skin becomes hot and dry and pungent, with dry palms and crusted tongue.

A patient may feel cold with a temperature of 105° F. so it is never wise to trust to one's sense of touch, or to the patient's sensations, but the clinical thermometer must always be used.

Rigors, or shivering fits, have some of the characteristics of an epileptic fit, the patient's temperature is high, possibly 105° F. although he is shivering and complaining of being cold. A nurse should at once take the temperature and report.

Chilliness is sometimes evidence of a high temperature. Do not judge only by the patient's skin, for, although very unusual, a patient has been known to have an apparently cool skin and yet be in a state of fever when his temperature was tested by means of the clinical thermometer.

In collapse, when the temperature is very low, the face becomes pale and leaden coloured, the extremities cold. The great object should be to get the circulation back, and for this purpose give as quickly as possible some hot stimulant, such as whisky, or brandy with hot water, put hot bottles to the feet and around the body, cover with a hot blanket, and apply large hot fomentations over the whole chest; rub the limbs vigorously *upwards*, so as to help the venous circulation, make up a good fire and get the room thoroughly warm as quickly as possible.

What is heat? We cannot say definitely. We know well the sensation caused by heat in our bodies. Heat is a mode of motion, or condition of matter, which is believed to be caused by the extremely rapid movements of very minute particles or molecules, and according to the rate of movement of these particles so is the heat of the body, if anything happens to lessen this motion, the body becomes cooler, if anything hastens the motion, hotter. Hence heat is merely a condition of matter, and can be transmitted from one body to another. Thus if a cooler body comes in contact with a hotter one, the latter loses heat to the former, this is called "*conduction*." If a moist body is exposed to dry air, the moisture is gradually converted into invisible watery vapour, this process is called "*evaporation*," and the moist body loses heat during the process. This illustrates the danger of sitting in damp clothes because while the moisture of the clothes is evaporating, the body of the person is becoming chilled. A hot luminous body such as the sun, or the fire, sends out heat by "*radiation*." These three methods, conduction, evaporation, and radiation, are those by which heat is transmitted.

Heat is a form of energy, which in our bodies produces force or power of movement. It is the result of combustion either of the tissues of the body or of the food taken into it. The blood takes up oxygen from the air in the lungs and carries it to the tissues, and the result of the combination of the oxygen with the tissues is called combustion. Thus heat is always being produced, and is given out by

radiation and also by conduction. In health the amount of heat produced and lost is equal. If the heat produced is greater than that lost we get fever; if less, death is the result.

The great means by which we retain heat in our bodies and prevent its loss by radiation is by adopting suitable clothes. In cold weather, when we want to retain all the heat we can, we choose flannel or woollen materials of some kind, because they are non-conducting. In hot weather, when we wish to be cool, we select light clothing, and of a texture to allow the heat to pass out.

A substance is said to be a "good conductor" when it passes on heat readily, and vice versa.

The effect of heat on almost all bodies is to cause them to expand, no matter whether the substance be solid, fluid, or gaseous.

The clinical thermometer is a glass tube, at one end of which a bulb has been blown, the bulb is then filled with mercury, and the instrument strongly heated to exclude all the air. The end of the tube is then melted so as to hermetically seal it, and it is set aside for some time to allow the glass to get back to its original calibre. The next process is to form the index by fixing the two extremes, freezing and boiling point, and graduating the part of the tube between these two with great exactitude. Our English clinical thermometers are graduated according to Fahrenheit's scale, that is 32° for freezing and 212° for boiling, whilst abroad the centigrade scale is chiefly used, or 0° marks freezing, and 100° boiling point. To mark the zero point on

the Fahrenheit thermometer the bulb is plunged into a mixture of salt and snow, and a mark is made at the point at which the mercury stands. This is 32° lower than the freezing point of water. Afterwards the thermometer is placed in the steam of boiling water, and the point on the tube where the mercury stands is marked boiling point or 212°. In the clinical thermometer we do not want such extremes of heat and cold, nor do we want a long tube which would be inconvenient to use, and would also be more liable to break. Hence the index of a clinical thermometer only ranges between 96° and 110° F.

Some thermometers have what is called a "magnifying index," that is the tube is so cut as to magnify the fine thread of mercury and so enable the observer to see it more clearly.

In choosing a clinical thermometer, there is some advantage in having a long bulb, and not a very thick one—but on the other hand, the stem should not be too thin. The index should be a good clear one. It is quite worth while for a nurse to have a good clinical thermometer, and one which registers correctly. There are instruments to be had now at extremely low prices, but it stands to reason that these cannot be as carefully made as the somewhat dearer ones. The important point if a thermometer is to be accurate, is that it should be left sufficiently long after being subjected to the great heat necessary in making it, before it is graduated. It can readily be understood that if a given quantity of mercury occupies a given space in a tube of a certain

calibre, it will if put into a tube of less calibre occupy more of the tube and vice versa. So it is with the thermometer, if the tube becomes smaller in calibre after graduation it will register higher than it ought to do, or the reverse. The clinical thermometer is generally made what is called "self-registering," that is, when removed from the patient it does not run down to the temperature of the surrounding air. This is managed by introducing a little air between the mercury, so that a small portion is thus separated from the main bulk in the bulb and the upper end of this separated portion marks the temperature of the patient. When the separated mercury is forced down into the bulb violently, as by holding the thermometer in one hand and then striking it on the other hand, the thermometer is said to have "run down" and is useless.

The temperature of the body is taken in various parts, the mouth is perhaps the most reliable, whilst the rectum is used in obstetric cases; the groin is used in children, and the axilla in hospital patients. Wherever taken it is necessary that the bulb should be well surrounded with flesh, hence the reason why one or other of the above places is selected, and care must be taken, especially when the axilla or groin is selected, that folds of nightdress do not intervene, and so falsify the reading.

Whichever plan is selected should always be adhered to, as the temperature is a trifle higher in the mouth and rectum than in the axilla or groin. If a change has to be made it should be noted on the

chart. If the patient is perspiring freely it must be remembered that the evaporation which is consequently going on from the surface of the skin cools it, hence unless carefully dried, the reading will be falsified.

A patient's temperature is generally taken night and morning, but in cases of fever, especially typhoid, or of acute rheumatism, it should be taken every four hours, because in these cases the temperature sometimes rises very suddenly and without any warning. After the temperature has been taken and noted down the index should be shaken down to 96° at once before putting away the thermometer. Nevertheless before using again the nurse should get into the habit of invariably looking to see whether the index is down to 96°.

Pyrexia means a high temperature, usually between 101° and about 105° F.

Hyperpyrexia means a temperature between 105° and 110° F. and is nearly always fatal.

LECTURE XIII.

Infection and Fevers.

General characteristics of Fevers—Importance of ascertaining Temperature—Characteristic Temperature Charts—Infection—General treatment of Fevers—Disinfection.

Fevers may be divided into infectious and non-infectious. Fever is often an accompaniment of other diseases, when it is merely a symptom of a disease, but not the disease.

Fever is caused either by an increased production or by a diminished escape of heat. In health, as we have seen, the production and the escape are balanced, but in fever this balance is disturbed, and whichever of the above forms of disturbance occurs, the result is the same, that is, fever is produced.

Fever always causes wasting, the increased heat in the body, and the more rapid circulation of the blood, together with perhaps hurried breathing, literally causes "burning away." Therefore it is imperative that a fever patient should have plenty of nourishing food in the form that he can best retain and assimilate, to counteract this excessive waste of tissue.

In fever there is always a diminution in the secretions. For instance, a phthisical patient gets a dry pungent skin, a dry coated tongue, diminished appetite, diminished excretion of saliva, and scanty

urine, which has also a high specific gravity in proportion to its decreased amount. All the functions of the body are profoundly upset. The nervous system also shares the general derangement, and the patient may become excited or dull. Delirium is most apt to occur after sleep, and may be active, or low and muttering, or maniacal.

There may be hyperpyrexia in sunstroke, acute rheumatism, enteric fever and some forms of brain disease.

It must be remembered that fever is in itself a danger if prolonged, quite apart from the cause. There is no special danger in a temperature becoming high, if it does not remain so.

In cases of pyrexia, when the temperature rises above 103°, or even remains at that, the patient should be sponged with cold or tepid water, the temperature being carefully taken both before and after. If it still rises, say up to 106°, *i.e.*, hyperpyrexia sets in, then a cold pack may be tried. Should it still be rising, or if the pack does not reduce it, and no medical help can be procured, then a nurse is justified in giving a cold bath, as it is a matter of life or death. Every precaution must be taken, the pulse carefully watched, and a stimulant should be given. A hot blanket and hot bottles should be ready in case of collapse. In all such extreme cases stimulants should invariably be given, and may be administered in the form of an enema, two ounces of brandy mixed with the yolk of an egg, and a little milk.

If a patient has a temperature of 107° or 108°, and

is collapsed, a nurse should sponge at once with the coldest water she can get, iced if possible, without even waiting to consult the doctor, as the patient is in a very dangerous condition, and no time must be lost.

Death is imminent with a temperature of 96° or lower, and 108° or over, but by timely treatment a patient with even a temperature of 110° has been saved.

It is very important in all cases of fever to have a four hour chart, or even a more frequent one. Many of the non-infectious fevers, such as pyæmia, and other inflammatory diseases, follow a fairly regular course, and many fevers have very characteristic charts. Thus in acute pneumonia the disease nearly always begins with a rigor, and the temperature rises to 104° or 105° perhaps, and remains about that height some five or seven days, with only slight morning and evening oscillations. At the end of that time there usually comes a sudden drop to normal or even subnormal, and finally it remains normal. If it does not fall before the twelfth day there are probably complications.

Another chart which very closely resembles that of pneumonia is erysipelas.

An attack of ague may be divided into three stages, a cold, a hot and a sweating stage. The attack begins with a rigor, and although the patient complains greatly of feeling cold, his internal temperature is often 103° or 105°. This is succeeded by the hot stage, during which the patient feels uncomfortably hot, and his temperature remains high. After

a time he breaks out into a copious perspiration and the temperature rapidly falls. Thus ague has a fairly characteristic chart, beginning about 103°, rising to perhaps 105°, and then dropping to normal and the whole attack may last from two to four hours. When the attacks recur every day it is spoken of as "quotidian" ague, or "tertain," if every other day, or "quartan," if two complete days intervene, and the attack recurs on the fourth day.

In enteric or typhoid fever there is also a somewhat oscillating temperature. It rises comparatively slowly during the first three or four days to perhaps 103°, and oscillates pretty regularly morning and evening, but always higher in the evening. If there is a sudden drop to 97° there is some complication, perhaps hæmorrhage or perforation, especially if there is a sudden rise afterwards. When there are no complications the temperature should fall gradually to normal.

The gradual decline is called "fall by lysis;" and occurs in typhoid fever; a sudden drop is called "fall by crisis," and occurs in pneumonia and typhus fever.

In pyæmia or blood poisoning, there is great irregularity. A sudden rise to 104° or 105°, and then a sudden fall to subnormal, after which the temperature will oscillate between these extremes.

In phthisis the chart is often very characteristic. It is also an oscillating one, but always rises at nights. In the morning it may be 98° or 99°, but in the evening it will probably be between 101° and 102°. At night also there are always copious sweats.

It must always be remembered that if a patient has a temperature of 103°, and a moist perspiring skin there is comparatively no danger, but the same temperature with a hot, dry, pungent palm would verge on the dangerous.

The best time for sponging patients is when the temperature would be naturally falling. As a rule the highest temperature is between five and eight in the evening. It falls after eight, and a patient ought to be sponged at this time, that is when the temperature would naturally be falling. The temperature falls between two and six in the morning, and then rises again. In most illnesses the time between two and four is most critical, and may truly be called the "darkest hour." Then the vitality is the most depressed, and death occurs more frequently than at any other time. Attacks of asthma and gout occur, and heart cases fail most frequently between these hours.

Antipyretics are dangerous as a rule, and it is much better to lower the temperature by means of spraying or cold packs (keeping the patient in for half an hour), or by baths, and only to give drugs to reduce temperature when the amount of fever becomes in itself dangerous. A fever patient cannot take cold in the ordinary sense of the word.

Alcohol is often given in cases of fever to counteract the rapid wasting, and it frequently tides over a dangerous time.

A fever patient should always have light bed clothes, and no heavy blankets or quilts or eiderdowns must be allowed.

Infection can be divided into two headings, since it must have two elements:—

1. The contagion, or infective organism.

2. The nidus, or environment or nest upon which it falls, and in which it takes root.

Although not proved with regard to all fevers, it is probable that they are due to a living organism, either plant or animal. These organisms, when they get into the body and find a suitable nidus, grow and multiply and probably produce changes analogous to fermentation, and act just as the yeast plant does in a sugar solution.

The infective fevers are enteric or typhoid, typhus, measles, whooping cough, scarlet fever, chicken pox, small pox, cholera, erysipelas, and diphtheria.

General treatment of fevers,—All fevers begin in much the same way. The patient complains of malaise, aching in the limbs, loss of appetite, high temperature, a sense of chilliness, or even a rigor. The great point, and often a serious difficulty, is the diagnosis. Hence in a doubtful case take precautions at once, but wait patiently.

The first precaution to take is the proper isolation of the patient. Before the nature of the fever may be decided, it is always best to keep the patient away from the rest of the household in a private house, and merely tell off one person to attend to him, and to keep herself as much isolated as possible. When the patient has been declared to be suffering from an infectious disease, then select a room in which to isolate him. In a private house, if possible, choose a room at the top of the house,

and preferably one communicating with another room, and as far from any other room as may be. Clear out all unnecessary furniture, also carpets, curtains, knick-knacks of all kinds, everything in fact which is likely to harbour infection. For the sake of the patient, however, do not quite denude it of everything, and make it too barn-like, which would be very trying to the nerves of a sick person. There should be at least a blind left to the window and perhaps some matting on the floor, especially near the bed. The use of the adjoining room is that the attendant can have it for herself, so that she need not be quite always with the patient unless he be very ill indeed. The room is also useful for any little cooking that may have to be done, and for washing up crockery, &c., as of course everything must be kept exclusively for the patient's use.

A sheet soaked in a disinfectant should be hung outside the door, and the lower edge should dip into vessels of disinfectant solution, so that it may remain damp.

The most essential points are:—

1. Ventilation.
2. Cleanliness.
3. Disinfection.

These must be carefully practised both during the course of the disease, and afterwards. The air of the room must be kept constantly changed, so as to keep it pure, as fresh air is a great enemy to infectious organisms. The room must also be kept scrupulously clean. The floor should not be swept, but should be swabbed over every morning with a

floor cloth wrung out in chloride of lime (if not disagreeable to the patient), in the proportion of one tea cup full of chloride of lime to every four pints of water or carbolic solution, one in twenty, or perchloride of mercury, one in five hundred, may be used.

As regards disinfectants, carbolic acid, one in twenty, and perchloride or bichloride of mercury, one in five hundred, are very good for the disinfection of linen, and of the nurse. For drains, sulphate of iron is good, in the proportion of one ounce to every pint of water.

When the patient is convalescent, and before mixing with other people, both he and his nurse must undergo thorough disinfection, and must afterwards change all their clothes. A carbolic bath of the strength of one in sixty should be taken, and a stronger disinfectant should be applied to the hair, which may be thoroughly rinsed with carbolic lotion, one in twenty, and then washed in water. Special attention should also be given to the nails. Carbolic soap may be used for the body.

To disinfect a room.—About $1\frac{1}{2}$ ℔. of sulphur should be taken for every 1000 cubic feet of room. This should be placed in an iron vessel over a dish of water. All the apertures of the room must be carefully closed, the damper shut down in the chimney, and the windows closed and fastened, and strips of tough paper pasted all round the frame and over the joining of the two sashes, and strips should be ready for the door in the same way. Remove all clothes that can be washed, but hang all that cannot on

ropes across the room. When everything is ready, set light to the sulphur, by either putting a few live coals on the dish, or some shavings and wood, and leave the room at once, pasting up all round the door, locking it, removing the key, and pasting up the key-hole. If the room is a large one, procure two iron dishes, and divide the sulphur, and burn in two lots. Leave the room thus closed for twenty-four hours, and then ventilate thoroughly by throwing open the windows and door, and opening the chimney.

Clothes and sheets can be thoroughly disinfected by first soaking in perchloride of mercury, one in five hundred. Care must be taken to leave them some time in contact with the disinfectant.

In towns all bedding, &c., can be sent away to be disinfected properly by steam, which is better than baking, *i.e.*, dry heat, as it penetrates better, and does not scorch the things. Disinfection can also be carried out by thoroughly boiling, or by baking in an oven at a temperature of about 250° F., which will kill all organisms. The floor of the sick room should be washed with chloride of lime, about $\frac{1}{4}$ ℔. to every four pints of hot water, or perchloride of mercury, one in five hundred, and everything in the room that can be washed should be cleansed with the perchloride of mercury, and the walls scraped, washed with disinfectant, and re-papered.

All excretions of the patient, during the course of the disease, should have strong disinfectant, such as carbolic, one in twenty, or perchloride of mercury, one in five hundred, added, and should be left in contact with it.

It should be remembered that the mucous membrane of the throat or nose when in a catarrhal condition forms a suitable nidus for infectious diseases, as also does dirt of all kinds.

LECTURE XIV.

Fevers and their Nursing.

Scarlet Fever—Measles—German Measles—Small-pox—Chicken pox —Diphtheria—Whooping Cough—Typhus—Typhoid—Erysipelas—Pyæmia—Cholera.

Fever eruptions.—For some days it is impossible to distinguish between the different kinds of fever. The same symptoms are present in nearly all cases, sore throat, high temperature, headache, and a general undefined sense of malaise. After a short time the characteristic rash will appear, and then a diagnosis can be made.

Scarlet fever and *Scarlatina* are exactly the same, and the latter is not a modified form of the former, as is sometimes supposed. The rash appears on the second day of the illness, on the chest, neck, and wrists, particularly the first.

Character of the rash.—It is fine and punctate, consisting of small, raised, very red points, which ultimately run together and form a general red surface, so that the patient has the appearance of a boiled lobster. On the tenth day, or even before, the rash disappears, and then follows the "peeling" stage, or desquamation.

Scarlet fever is usually ushered in by loss of appetite, sickness, severe headache, sore throat, and rigor. The throat trouble is often very severe.

Complications of scarlet fever.—The great danger is that the patient may die from the severity of the poison, and then from the first there can be no hope.

Children are more liable to scarlet fever than adults, and a nurse should always notice whether the child puts his hand to one side of his head, or if he will not lie on that side and is very restless. The inflammation of the throat may spread through the Eustachian tube to the middle ear, and give rise to great pain, and a discharge which if not attended to, may go on and become chronic, extending to the inner ear, and causing absolute deafness, or it may even form an abscess in the brain, and cause the patient's death.

A serious complication in scarlet fever is inflammation of the kidneys, which generally occurs during the third or fourth week of the disease, from either exposure to cold, or a peculiar tendency in the patient to weakness of that organ, or from a too speedy return to a full meat diet. Inflammation of the kidneys occurs in a very considerable proportion of patients. Some people think this is entirely due to cold, and special care ought to be taken of a scarlet fever patient in this respect during convalescence. It is, however, probably far more often due to the extra work thrown on the kidneys by having to get rid of the poison of the disease. Very little meat or nitrogenous food, therefore, ought to be given until after the third week, so as to give the kidneys as much rest as possible.

At the beginning of the disease, and before the

appearance of the characteristic rash, it is sometimes difficult to distinguish between tonsillitis and the sore throat of scarlet fever.

The risk of infection in scarlet fever, both to the nurse and others, is from the excretions, and from the scales given off during peeling. In private houses, it is well to anoint the patient's skin with carbolized oil. Great care is required in disinfecting linen, &c., that these scales should not carry infection.

The incubation period in scarlet fever is from one to eighteen days.

Measles, or Morbilli.—The eruption generally appears about the fourth day. This disease generally begins with a period of headache, loss of appetite, vomiting, furred tongue, sore throat, and running at the eyes and nose, so that at first the patient is thought to be suffering from a severe cold in the head. Sometimes it begins with a rigor, or convulsions. The rash begins on the face, and extends downwards for about three days to the chest, and then to the rest of the body. It then vanishes, and a slight desquamation takes place.

Character of rash.—It is slightly raised and mottled, and arranged in crescents which ultimately run together. It is red, but not scarlet as in scarlet fever.

The most usual complications are bronchitis and disease of the middle ear. The last may also occur in scarlet fever. It sometimes gives rise to abscesses of the brain, and in the skull. It is generally a child in whom this complication occurs. He will seem ill

and feverish, then will not lie on the bad side, and puts his hand to his ear, and is very fretful and irritable. He should be seen by an experienced physician, or by an aurist, without delay.

Measles is very apt to leave some pulmonary weakness. In adults measles may be very severe; with children, if no complications set in, it generally runs a very regular course. The nursing is simple, and consists chiefly in guarding the child from all cold, keeping him in an even temperature, and keeping up his strength with suitable food. The infection is carried chiefly by the excretions, and hence all handkerchiefs used must be carefully disinfected, or better still, pieces of soft old linen should be used, and at once burnt.

The incubation period is from ten to fourteen days.

German measles differs from both scarlet fever and ordinary measles, but is allied to both, and gives no immunity from either.

The rash is a cross between that of measles and scarlet fever, and appears on the first day on both the face and chest. Sometimes the glands of the neck are somewhat enlarged. There is sore throat, but little, if any, running at the nose.

Desquamation is usually absent, or very slight indeed.

Small-pox, or *Variola*.—The rash appears on the third day. The earliest symptoms are headache, vomiting, and pain in the lumbar regions, with fever and coated tongue. The rash almost always begins first on the backs of the wrists and forehead, and

then spreads to the chest and back, and the body generally.

Character of the rash.—Hard, shot-like papules, which seem to roll under the skin in the early stages. Next they become vesicles about the third day, and appear "umbilicated," that is flat and depressed in the centre. About the fourth day these vesicles become pustules, which finally break and form scabs, and when these come away they often leave a depressed scar.

Small-pox is extremely infectious until all the scabs have been removed, and the skin perfectly healed, and most careful disinfection is required.

The period of incubation is about fourteen days.

The best safeguard against this terrible disease is vaccination, which is certainly a great protection.

Chickenpox, or *Varicella.*—The rash appears on the first day, on the face as a rule. It generally occurs in children or infants, rarely in adults, though if it does it assumes a somewhat more serious form. With children the symptoms are usually slight, without much fever.

Character of the rash.—Small papules or blisters, as if the patient had been sprinkled with boiling water. These papules are at first filled with clear fluid, which afterwards becomes slightly turbid, and then a little crust forms in two or three days, which dries up and drops off after about five days. The eruption appears in successive crops, and the pustules are small, round, and not "umbilicated."

This is a trifling disease as a rule, and there is no risk, though occasionally it may be very severe.

The child must be kept warm, and in one room at an even temperature, and away from other children. The bowels should be kept open with very mild laxatives.

The period of incubation is from fourteen to twenty days.

Diphtheria is a very infectious disease, but is not attended by any rash. There is severe sore throat, with the formation of membrane on the tonsils and surrounding parts. There is great prostration and much constitutional disturbance, and swallowing is very painful. The glands of the neck are generally swollen. There is headache, fever, sickness, and great weakness. All possible measures must be adopted to keep up the patient's strength, and if sufficient food cannot be taken by mouth, nutrient enemata must be given.

Sometimes the breathing becomes so difficult that tracheotomy has to be done to relieve it. Sometimes paralysis occurs during convalescence. Infection is carried by means of the membrane coughed up. Hence if a nurse has to make applications to the patient's throat she must guard herself very carefully against any fragments of membrane which might be coughed up during the process. It is wise for her to wear a veil or mask as a protection.

Very thorough disinfection of bedding, bed curtains, and the rooms generally is necessary after diphtheria. The nurse should disinfect her hands each time after attending to her patient.

Diphtheria is a very serious disease, and very often fatal.

The period of incubation varies from a few hours to several days.

Whooping cough is an infectious disease without rash. It is only transmitted to children as a rule, begins with fever and vomiting, sometimes also with the symptoms of a head cold, and ultimately the peculiar paroxysmal cough. Sometimes it is a complication in measles, and occasionally it leads to laryngitis, with stridor and collapse of the lungs.

The child must be kept warm, and the strength maintained as much as possible.

The incubation period of whooping cough is fourteen days.

Typhus, also called gaol fever, is essentially a dirt disease, and is happily rarely met with now. The rash appears on the fourth day. The disease begins with a rigor, malaise, headache, and contracted pupils. The patient appears dull and heavy as compared with the bright eyes flushed face and dilated pupils of typhoid fever. There is a peculiar smell of rotten straw or mice hanging about the patient. There is great weakness, with perhaps restlessness and irritability.

Character of rash.—Red spots and petechiæ, raised and not disappearing on pressure, giving a general dusky appearance to the skin, which is mottled, becomes dark, and of a mulberry colour. The severity of the attack is determined by the amount or extent of the rash. A crisis occurs on the fourteenth day, and after that is passed all danger is over, and the patient becomes convalescent rapidly.

This is an extremely infectious disease, though

the contagion is said not to extend beyond about four feet from the patient, and the poison being only dangerous in a concentrated form is easily destroyed by fresh air and hence the necessity for thorough ventilation of the room. If this is attended to properly the nursing of typhus is not fraught with danger. It is attended by great danger. Death may occur from the intensity of the poison of the disease, or from failure of the heart and exhaustion, or from lung trouble, such as acute bronchitis, pleurisy, or pneumonia. There is generally delirium, often bladder trouble, and incontinence of fæces.

Everything must be done to try to counteract the great prostration characteristic of this disease; stimulants must be given somewhat freely. Careful watch must be kept for retention of urine, and all precautions taken against bedsores, which are very liable to form.

The period of incubation is twelve days.

Typhoid fever, or *Enteric fever*, was formerly called "abdominal typhus," and hence is still sometimes popularly confused with the above. The rash appears on the seventh day. This fever sets in with rigor, headache, malaise, constipation or diarrhœa, and general abdominal uneasiness; the tongue is frequently red round the edges, and white in the centre, the pupils of the eyes are dilated.

Character of the rash.—Rose coloured spots, varying from $\frac{1}{12}$ of an inch in diameter of the size of a pea. They appear in crops, and disappear on pressure, re-appearing when the pressure is removed. They come on the abdomen, and sometimes also on

the back. One crop dies away and another appears. The spots are not much raised.

Typhoid fever is associated with ulceration of the lower part of the small intestine. In this part of the intestine there are small flat raised patches projecting slightly into the interior of the intestinal tube, and called Peyer's patches. The pain is generally complained of in the right inguinal region. During the first week these patches are getting inflamed and congested; during the second they slough; in the third the slough comes away leaving an ulcer, and by the end of the third or the beginning of the fourth there is danger of perforation and hæmorrhage, owing to the thinning of the coat of the intestine from the separation of the slough. This is the critical week, and the danger is often increased by the fact that the patient himself as a rule feels much better owing to the clearing up of the ulcers, and he often begins to crave for solid food. If the temperature, which has been oscillating between 103° and 104°, suddenly drops to perhaps 99°, or even to subnormal, it generally denotes hæmorrhage or perforation, and the danger is very great. Not that hæmorrhage is by any means always fatal, but it is a very grave symptom.

The cause of typhoid is impure water or milk, contaminated by the contents of cesspools or sewers, by bad drains, or may be caused by direct contagion from the excreta of an infected person. The general symptoms of typhoid are rise of temperature, deafness, retention of urine, a dull heavy aspect, stupor, diarrhœa, the motions having the colour and consis-

tency of pea soup, tenderness over the abdomen on pressure, and epistaxis.

Nursing.—When a case is diagnosed as typhoid fever, the following rules must be strictly observed :—

1. The patient's clothes must be disinfected thoroughly as soon as possible after removal.

2. All vessels, such as cups, jugs, feeders, bed-pans, &c., are to be marked and kept exclusively for the patient's use.

3. All linen (shirts, sheets, &c.,) used by the patient are to be put at once into a covered pail containing carbolic acid, one in twenty, or corrosive sublimate solution, one in five hundred, or any other disinfectant which the doctor may prefer. Enough of the solution must be poured in to completely cover the articles. When such linen is soiled by evacuations from the patient, a pail with disinfectant is to be brought to the bedside, and the linen to be put in it immediately.

4. Before giving a bed-pan or urinal to the patient put in it (unless orders to the contrary are given) a little carbolic, one in twenty, or corrosive sublimate, one in one hundred, and after use add more disinfectant, and thoroughly cleanse the same.

5. No discharges from the patient must be left under the bed. All bed-pans must be provided with covers, and must at once be covered before removal from the room.

6. If a typhoid motion is to be kept for inspection by the doctor, put it in a glass pan with a cover. Unless contrary orders have been given, put some

disinfectant in the pan first, and under the lid place a piece of lint or old linen thoroughly soaked in strong disinfectant, which must afterwards be at once burnt. Do not keep the vessel containing the motion in the room or ward, but remove to the lavatory.

7. No typhoid stool must be kept longer than twenty-four hours, unless special orders are given. Every typhoid stool that has been kept for inspection must have a fresh supply of disinfectant added to it before it is finally disposed of.

8. Cleanse the thermometer in carbolic, one in twenty, after each time of using.

A basin containing some disinfectant should stand near the bed, into which the nurse must always dip her hands after attending to the patient.

The nursing of these cases requires special care. Patients must not be allowed to sit up, to stand, or to get out of bed on any pretence whatsoever. Neither must they lie flat on their backs for too long together, for fear of pneumonia or bedsores, but must be turned very gently from side to side, and if necessary propped on one side (if there is great weakness) and carefully supported by pillows.

The diet generally consists entirely of milk, and should be given about every two hours, and four ounces or so at a time. Never give stimulants on your own responsibility, and without the doctor's orders.

Sometimes the temperature runs very high, and then means must be taken to decrease it, either by means of drugs, such as anti-fibrin, or anti-pyrin, or

by sponging with cold, iced, tepid or hot water. Sometimes packs are ordered, or ice baths, or ice cradling, but the doctor will always tell the nurse which he prefers.

The fever generally lasts about twenty-eight days, and as a rule, under ordinary circumstances, no spots appear after that time unless there is a relapse, when they, together with all the other symptoms, will reappear. The temperature must be taken every four hours, and oftener if necessary, and any sudden drop or rise should be reported at once. The former may be due to the effect of certain drugs but it may also point to hæmorrhage or perforation. When the sloughs have cleared away in the third week, the intestine is so extremely thin that even sudden moving might cause perforation.

The patient should be placed on a spring mattress if possible, with a hair mattress over, and the bed clothes must be very light, but sufficient.

Great care must be taken to prevent bedsores, and the back should be rubbed night and morning with spirit, and if there is any tendency to dampness zinc ointment must be rubbed in.

The recovery from typhoid is generally characterised by "lysis," or a gradual decrease of temperature, but recovery cannot be considered complete until the evening temperature shows entire freedom from fever, and even after this the temperature should be taken night and morning for fully a week. The return to a full diet must be very gradual indeed, beginning with rusks, arrowroot, &c., then a little light, easily digested fish, followed in due time by

white meats, and so on until mutton, and finally beef, may be taken with safety. Patients recovering from typhoid will eat anything and everything they can get, so a strict watch must be kept. Milk is quite the most important article of diet during the continuance of the fever. Never trust to beef-tea. A good nurse should vary the flavour of the milk in different ways, so as to disguise it, and make as many changes as possible.

The period of incubation varies from fourteen to twenty-one days.

Typhoid is infectious only through the excretions, and hence these must be most carefully disinfected, together with all linen, especially that which is soiled. Typhoid is not infectious through the air, and hence patients need not be so carefully isolated.

It is a reproach to a nurse if she gets typhoid fever from her patient, as it shows there has been some degree of carelessness. A nurse, whether she is attending a typhoid or any other fever patient should keep herself in robust health, eat plenty of good wholesome food, get some out-door exercise every day, and be sure she gets a proper amount of sleep. If she attends to these points, and carries out disinfection thoroughly and intelligently, there is no need for her to fear contracting the disease from her patient.

In a private house all the milk and water should be boiled, and care must be taken that it is actually boiled, and not merely warmed.

The complications which are to be feared in typhoid fever are pneumonia, hæmorrhage, peri-

tonitis, which is serious, perforation, which is generally fatal, bronchitis, severe diarrhœa, and bedsores.

If there is danger of pneumonia the patient feels very much exhausted, lies on his back, the blood stagnates in the base of the lung, and there follows a low form of pneumonia. To obviate this, turn the patient gently first on one side and then on the other, so as to allow the lungs to empty themselves of the stagnant blood. The nurse should endeavour to ward off pneumonia by turning the patient from side to side from the outset of the fever; this will also lessen the chances of bedsores.

Retention of urine, and retention with incontinence is also to be looked for.

Phlebitis, or inflammation of the veins, is an occasional complication. It begins with pain in the groin, followed by swelling, and œdema of the leg. This usually occurs during the period of convalescence.

General eczema may be confused with scarlet fever and measles, especially in the case of children, who when they come into hospital frequently make their first acquaintance with soap and water, and this, together with a change of habit and diet, often causes eczema.

Erysipelas arises from certain germs getting into the tissues through an abrasion of the skin. It is of the nature of a fungus, and once it gets in it cannot be stopped.

The first symptoms are rise of temperature, rigor, vomiting, and redness around the wound, of the

nature of a rose coloured blush, but with very sharply defined edges.

In erysipelas of the head and face watch for delirium, and possibly suffocation. Great cleanliness must be observed, and anything in contact with the patient should be carefully disinfected.

Infection is usually only carried through an abrasion of the skin. Erysipelas does not as a rule follow amputations, but it may if the urine contain albumen. It is a serious matter if it attack those who are intemperate.

Generally the temperature is high for about seven days; and then in satisfactory cases gradually descends.

The period of incubation is from three to seven days.

Pyæmia.—This usually sets in with a rigor, generally a severe one, with high temperature, perhaps 103° or 104°, or even higher, followed by profuse sweating. The rigors are repeated from time to time, the temperature chart showing a series of long up and down strokes, and the morning temperature seldom normal. The pulse is quick, the tongue red or glazed-looking, and later on it becomes dry and brown. Wasting sets in rapidly. The skin often assumes an earthy or jaundiced look. The face is anxious, flushed, or pale. Abscesses form in various parts, as in the liver, lungs, and joints, and there is diffuse suppuration in some serous cavity, with symptoms of pericarditis, pleurisy, or peritonitis. Diarrhœa sets in, followed by delirium, and the patient dies exhausted, usually during the second

week. Acute cases are always fatal; chronic ones may recover.

Cholera of the malignant form is to be much dreaded.

The disease sets in suddenly, as a rule, and without much warning. There is severe diarrhœa, and vomiting, with collapse, and the patient complains of cramps with severe pain in the calves of the legs. The infection is carried by the evacuations, and great care must be taken about disinfection, which must be thorough and conscientious. Warmth must be applied in every possible way, to counteract the collapse, and friction may be employed to relieve the cramps and every effort made to get the patient to take food, which should be warm. When the vomiting is great this, however, is almost an impossibility.

LECTURE XV.

The Nervous System and Nervous Diseases.

The Structure of the Nervous System—Motion and Sensation—Membranes of the Brain—Fits—Minor and Major Epilepsy—Jacksonian Epilepsy—Apoplexy—Unconsciousness—Delirium—Coma—Paralysis—Signs of impending death.

The nervous system is packed away in the cranium or skull and in the spinal column. It consists of three parts :—

1. The brain.
2. The spinal cord.
3. The nerves.

The spinal cord is contained in the spinal column which forms a long canal for it.

The brain is contained in the skull.

The nerves branch off from the spinal cord to supply all parts of the body, and also from the brain. All these have the same elements :—

1. Nerve cells, and
2. Nerve fibres.

The most important are the nerve cells, which have many different forms, and a nucleus in the centre. They consist of irregularly shaped masses of protoplasm which give off processes in various directions. Many of these processes branch, but there is often one that does not, and this forms the central portion of a nerve trunk. These cells when aggregated form the so-called "grey matter."

As regards the nerve fibres, their most important part is in the centre. The central portion of nerve fibres consists, as above mentioned, of a process or prolongation of a nerve cell. It is the most important part and is called the "axis-cylinder." It is surrounded by some white fatty material and outside that by a fibrous sheath. These nerve fibres when aggregated form what is called the "white matter."

The nerve cells or grey matter originate or receive the message, the nerve fibres conduct it. They may be aptly compared to the telegraph clerks and the telegraph wires. The outer surface of the brain or "cortex" is thrown into many wrinkles or "convolutions," and this outer part consists of grey matter, and is composed of an enormous number of nerve cells. The grey matter thus forms a kind of thick rind within which is the white matter, which consists of the nerve fibres that pass from the cells in the cortex, some of which convey messages from the brain to the spinal cord and so move the limbs, whilst others convey messages to the brain from the spinal cord. All the functions of the brain are located in these cortical cells, certain of them presiding over motion, whilst others have to do with sensation. The nerve cells concerned with movement are situated in the middle part of the lateral aspect of the brain and occupy an area nearly as large as the palm of the hand. This is called the "motor area." Thus there are two structures in the nervous system, the nerve cells and the nerve fibres, and there are also two parts in the brain, the cerebrum or great

brain and the cerebellum or little brain. Inside both these are subsidiary matters, and projecting from the medulla oblongata and forming a continuation of it is the spinal cord. Some parts of the nervous system are concerned with sensation and some are concerned with motion. The right side of the brain affects the left side of the body and *vice versâ*. Suppose, for instance, I want to move my right hand. The motor impulse would start in the grey matter of the convolutions of the brain on the left side, traverse the white matter in its interior and pass through the medulla, then it crosses over to the right side, and goes down the spinal cord as far as the shoulder. Then it enters the arm by the nerves which have left the spinal cord, and goes down the arm to the fingers and moves the particular set of muscles required. If the path of the motor impulse above the medulla be interrupted, paralysis of the opposite side will be the result, or "hemiplegia."

Sensation travels in the opposite direction to motion. There are numerous small nerves just under the skin, and when one's finger for instance is touched, the sensation travels up the arm by a "sensory" nerve to the spinal cord, and crossing over to the other side of the cord ascends to the brain.

The brain exercises complete control over the entire nervous system, but there are several things which occur independently of it, to a certain extent. Thus a man is completely paralysed below the waist, and yet when you tickle the soles of his

feet his legs are drawn up, although he is quite unconscious of the action. After an injury to the spinal cord, all the reflexes are sometimes exaggerated.

It is important to distinguish between loss of motion and loss of sensation.

In loss of sensation there is no feeling at all in the part but there is power of motion.

In loss of motion there is plenty of feeling but total inability to move.

Membranes.—The brain must be plentifully supplied with blood, and therefore round it is found a thin delicate membrane composed of a close network of vessels, which is called the "pia mater." Over this again, is another thin translucent membrane called the "arachnoid," which secretes a fluid which acts as a water-bed on which the brain rests and which saves it from many jars during quick movements. Over this, and also lining the interior of the skull, is a tough whitish membrane, called the "dura mater."

The spinal cord is even better protected than the brain. It is slung up in the middle of the spinal column by thirty-three threads on each side.

Fits is a vague term, and includes many different diseases, which, however, have now been classified. Perhaps the most common form of fits is epilepsy, this is of various kinds. True or genuine epilepsy is divided into two kinds, called major and minor epilepsy. The various forms of fits vary considerably, but still there is a strong family likeness between them.

Minor epilepsy is more common than most people think. It is generally over in about thirty seconds. It may not amount to more than a fierce expression of the eyes, or to very slight twitching.

Sometimes there suddenly appears a shadow across the face, and the person seems to be in a reverie, and during these few seconds he is quite unconscious. Sometimes a scene of childhood will come before him during these few seconds. Sometimes these slight attacks are the precursors of the major epilepsy. These slight fits, too, are sometimes followed by prolonged mania, during which the patient will occasionally commit some terrible act, such as a mother will kill all her children, perfectly unconscious of what she is doing.

Some very passionate children, who go into unreasonable fits of temper, during which they tear up and destroy everything on which they can lay hands, are in reality epileptic.

Major epilepsy generally begins in early life, at the ages of 8, 10, 12, or in rare cases even so late as between 25 and 40.

As a rule the patient is apparently quite well, when suddenly he feels something wrong, which he generally knows indicates that a fit is coming on. The sensation is very vague, sometimes like a breath of air, or a vague sense of anxiety in the pit of the stomach, followed by a feeling of giddiness, and then quivering. This lasts for a few seconds, and then the patient falls down, sometimes giving a loud scream previously. He is perfectly unconscious and paralysed for the time. The limbs are rigid, the

jaws clenched, generally the tongue is bitten, and sometimes urine or a motion is passed. Sometimes the limbs are convulsed, and then jerk about in an aimless manner without co-ordination for from one to two minutes, and then the patient lies quite still, breathing steadily. Sometimes there is frothing at the mouth, and he looks as if he were going to die, but rarely does. The fit, as a rule lasts about two minutes, but the unconsciousness may last much longer. The patient regains consciousness gradually, the eyes open, but his look is dazed and stupid, and he has no knowledge of what has happened, and remembers nothing but the warning symptoms or "aura." He complains of severe headache, is confused in his head, and usually falls into a deep sleep, from which he awakes quite well.

Sometimes it is a little difficult to distinguish between an epileptic fit and hysteria. In the latter, however, the patient will get up and walk away after a fit, and the mind is quite clear. Also the movements are purposeful, there is twitching of the eyelids, and the patient always takes care how she falls, and does not hurt herself, whilst an epileptic patient will fall down anywhere, and sometimes strikes her head severely or falls into the fire, &c. In hysteria the patient also never bites her tongue. There is generally some explanation for an hysterical fit such as bad temper or something which has offended previously. There is no "aura" in hysteria.

Sometimes syncope looks very like an epileptic fit.

There is very litttle to be done for epilepsy. Do

not dash cold water over the face, nor try to set the patient upright, but let him be flat. Open the dress at the neck, put something, if possible, between the teeth to prevent the tongue from being bitten, and only try to restrain the patient as much as will prevent him from hurting himself, for example, see he does not get smothered in bed.

In that form of epilepsy called "Jacksonian" or epileptiform seizures, the peculiarity is that there is, as a rule, no loss of consciousness, but if there is, that loss does not come on at the beginning of the fit. The chief characteristic is some local contraction or uncontrollable jerking of the thumb, finger or arm, face or perhaps leg. The fit may be very quickly over, but is always preceded by this jerking. A nurse should carefully note the order of the spasm, and whether the whole fit is over at the same time. Many people have an epileptic fit without knowing it. They wake up in the morning with their tongue very sore, with blood-shot eyes, and a headache, and during the night they have had a fit without knowing anything about it.

Children have very slight epileptic fits, which amongst the lower orders are called "inward fits." The child stops breathing, and turns black in the face. This generally occurs in the sleep. The child should be roused and some warm food given him, and he should be made to take several deep breaths. These fits are generally caused by a spasm of the larynx.

Apoplexy.—Underneath the surface of the brain are numerous blood vessels which enter it, and if any of

these are injured or burst, they break up the brain tissue around. The patient falls down insensible and is unconscious for some hours, or days. The breathing is stertorous, the face and lips are purple, and the pulse slower than normal, although this symptom alone may occur in many forms of insensibility. To prove if it is paralysis of one side of the brain, lift the right arm and let it go, if it falls down a dead weight, and on trying the other side in the same way it does not drop, but simply falls a short way, then you know that you have a ruptured blood-vessel on the left side of the brain, or *vice versâ;* more especially if the mouth is drawn to the left side, as it is always drawn to the injured side of the brain, because the muscles of the affected side of the body have lost their power of contraction.

In apoplexy it may be wise to apply ice to the head, at any rate it will do no harm. It would perhaps be most useful to apply it on each side of the neck for ten minutes at a time, and then take it away and re-apply it. By doing this the blood-vessels are contracted and so the amount of blood to the brain is diminished. If possible it is very much better not to disturb the patient, take him to the nearest place where he can lie quite quiet.

It is very difficult to distinguish between drunkenness and apoplexy. The smell of alcohol is not sufficient guide, as a glass of spirit may have been taken just before the fit, and in a certain way may have caused it. If one side is paralysed, tested as above described, you may be certain it is apoplexy,

and in all cases it is better to give the patient the benefit of the doubt. When the hæmorrhage takes place in the lower part of the brain, which is an unusual part, even experienced physicians have sometimes great difficulty in distinguishing it. When the unconsciousness is due to alcohol, the pupils are dilated, and you can often tell by the general appearance of the patient.

In opium unconsciousness the pupils are very much contracted, and there is the unmistakable odour of opium. Just before death, however, the pupils become widely dilated. This is a certain sign of death.

In unconsciousness caused by a blow on the head, there will be bleeding from the head, ears and nose.

Sometimes a man who has had kidney disease, or diabetes for years, falls down suddenly quite insensible.

Delirium does not often occur in brain disease, but is very common in lung disease, and occurs most frequently in those who habitually take alcohol in excess.

Coma is really unconsciousness. The mind has gone, and the body lies like a log.

Paralysis occurs from two causes, brain disease and spinal disease.

Paralysis from brain disease is generally due to hæmorrhage which has torn across the nerve fibres coming from the motor area of the brain. It may also be caused by a tumour or an abscess on the brain.

Paralysis due to brain disease usually affects one side of the body only and is called hemiplegia. Whilst that due to spinal disease (paraplegia) generally affects both sides of the body below a certain level.

In *hemiplegia* sensation is generally unaffected, but in paraplegia there is often loss of sensation in the paralysed limbs.

Diseases of the nerves.—There are many varieties of these, for instance:—

Facial paralysis, when the nerves of one side of the face are diseased. This is often the result of ear mischief.

Saturday night paralysis is brought about by a person going to sleep with his arm over the back of a chair, and the pressure, being continued for a long time, paralyses the nerves of the arm, and it may remain useless for so long even as six weeks.

Facial tic is a very common nerve affection, and is very painful.

Alcoholic neuritis is a widespread inflammation of the ends of the nerves. It causes paralysis and also sensory symptoms, sometimes pain and tenderness, and sometimes anæsthesia. It is more common in women than men.

In mental diseases there is a change of manner, and from being of a sociable disposition, a man becomes unsociable, from being good-tempered he becomes ferocious, from being a miser he becomes a spendthrift, or *vice versâ.* His mind gradually goes and he ends his days in an asylum.

Signs of impending death.—An indescribable change

in the face comes over the patient; the extremities are cold, the lips leaden, the brow beaded with perspiration, and then follows failure of the tripod of life, namely the heart, the brain, and the lungs.

APPENDIX.

MEDICATED BATHS.

Alkaline Bath, made by adding 1 lb carbonate of soda to hot water.

Creasote Bath, by adding three fluid drachms of creasote and four fluid drachms of glycerine to hot water.

Sulphur Bath, by adding four ounces of sulphurated potash, or "liver of sulphur," to hot water.

SIMPLE OINTMENT.

This is merely carefully purified lard, to which no drug has been added. It is the basis of all ointments.

TO PEPTONIZE MILK.

Dilute a pint of milk with a quarter of a pint of water and heat to 140° Fahrenheit; or divide the mixture into two equal portions, heat one portion to boiling point, and then add the cold part to it. Next add three fluid drachms of Benger's Liquor Pancreaticus, and twenty grains bicarbonate of soda. Mix well and leave in a covered jug and in a warm place for an hour and a half. Boil for two or three minutes before using it.

TO PEPTONIZE BEEF TEA.

Mince finely half a pound of lean beef, add to it one pint of water and twenty grains of bicarbonate of soda. Simmer the whole for an hour and a half. Allow it to cool down to 140° Fahrenheit, and then add one tablespoonful of pancreatic solution. Keep the mixture in a warm place for a couple of hours, stirring it occasionally. Then strain carefully and without pressure, and boil for five minutes.

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